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ABSTRACT

The purpose of the Aerospace-Aviation Education Task Force was to study the problems and present recommendations for space and aviation education in California. Educational trends and the increasing rate of dropout occurrence reveal a need to introduce changes in the education and training of students. Many career opportunities exist in the field of aerospace and aviation. Committees were formed to concentrate on the various existing educational levels. The following levels were studied and several aspects of their programs are discussed with recommendations for their development: (1) elementary and junior high schools (description of exemplary programs); (2) high schools and community colleges (requirements for a standard designated subjects teaching credential in aviation flight instruction and/or aviation ground instruction, courses in aviation education, and commentary on the education code); (3) colleges, universities, and private schools (description of aerospace or aeronautical programs in various institutions); and (4) industry and the professions (findings from a survey of aerospace industry employers on their opinions regarding the needs of aerospace education, a discussion on recent technological developments, and an overview of aviation education in the Soviet Union). Materials related to the activities conducted by the task force are appended. (EC)

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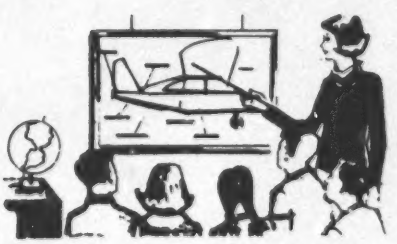

AVIATION EDUCATION

DEPARTMENT OF TRANSPORTATION/FEDERAL AVIATION ADMINISTRATION
OFFICE OF GENERAL AVIATION/WASHINGTON, D.C. 20591

STATE OF CALIFORNIA

RONALD REAGAN
Governor

Governor's Aerospace-Aviation Education Task Force

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December 31, 1971

Dear Governor Reagan:

It is a privilege and a pleasure for me to submit to you the report of the Governor's Aerospace-Aviation Education Task Force.

In creating the Task Force in 1969, you set forth its purpose in a seven-fold mission charter. Essentially, the mandate to the Task Force required that recommendations be developed for the adoption of space and aviation concepts in the Elementary, High School, and Junior College levels of the State, based upon existing and projected requirements of the aviation and space industries; that a statement be developed for the Governor's possible use in reporting to the Legislature on the needs of education and training in aviation and the space sciences, based upon opinions of the Statewide Aerospace Education Advisory Committee to the State Superintendent of Public Instruction, and all other organizations with particular concern for education in these fields of endeavor; that the Task Force learn enough about existing aerospace and aviation education programs to facilitate recommendations for the use of such programs as models, or changes that should be implemented to strengthen them; that the Task Force prepare a statement of economic implications of aviation and the space sciences for the State of California, to be distributed to all educators assigned the task of curriculum preparation and evaluation.

You also recommended that the Task Force confer with State and Federal Agencies assigned aviation education responsibilities, to learn about the obstacles confronting implementation of appropriate programs, and to recommend solutions to the problems found. As further guidance, you indicated that due

to the combination of Intrastate, Interstate, International, and Intercontinental nature of air travel and traffic operations, future activities would require participation and coordination with other State Aerospace Education Councils, the Federal Aviation Administration, and National Aerospace Council Conferences that must inevitably evolve as we keep pace with the rapidly changing technological factors in aerospace and aviation enterprises.

The Task Force which you appointed included thirty ladies and gentlemen from every phase of aeronautics, aviation, education, industry, and government. In addition, the Task Force sought and received assistance from numbers of other individuals who had particular expertise in certain aspects of aerospace-aviation and education. Support and cooperation were also obtained from the Superintendent of Public Instruction, from Industry, and from the Chancellors of the University of California, the State Colleges, and the Community Colleges, especially in a consultative role.

Under your mandate, the Task Force divided itself into a number of committees for the purpose of concentrating its efforts on specialized problem areas and possible solutions. The committees were established in the following areas of concern:

1. Elementary Schools and Junior High Schools.

2. High Schools and Community (Junior) Colleges.

3. Colleges, Universities, and Private Schools.

4. Industry and the Professions.

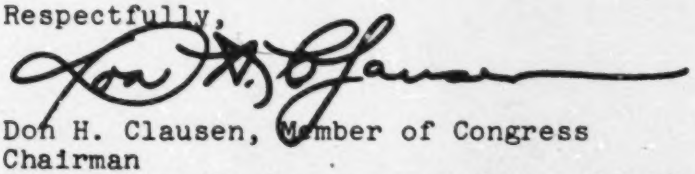
In the more than two years of its existence, and operating without any funding, the thirty members of the Task Force explored all aspects of Aerospace Education. As might be anticipated, problems at the various levels were manifold, and the members of the Task Force expended their energies in searching for solutions. All of the efforts of the Task Force members were at their own personal expense. In the body of this report, you will find recommendations by the Task Force. Unquestionably, there are advantages to be realized from broadening the availability of aerospace-aviation education. This was reiterated in the thoughts and ideas of each of the committees. No easy solutions were found, nor was it anticipated that such solutions could ever be discovered. The Task Force, in recommending certain actions, is fully aware that cost is one of the main considerations in any field of endeavor, and certainly in the educational area. We of the Task Force have not lost sight of cost implications, but we feel that a cost/benefit analysis will bear out the need for the State of California to assume a more positive role in sponsoring and supporting greater development in

aerospace-education offerings to more of our populace -- in particular, to our young people.

California has long been looked to for guidance, and as a prime example of creative and forward-looking educational excellence. Recent years, however, have seen other states assume a more dominant and productive role in such areas. It is the overwhelming conclusion of the Task Force that action must be taken to restore to California its position of leadership.

The Governor's Aerospace-Aviation Education Task Force respectfully submits this report and its recommendations, and suggests that it has discharged the mission you assigned to it. Speaking for the Task Force members, I am grateful that we have had the opportunity to serve you and the great people of the State of California.

Respectfully,



Don H. Clausen, Member of Congress
Chairman
The Governor's Aerospace-Aviation Education Task Force

WILSON RILES
Superintendent of Public Instruction
and Director of Education

STATE OF CALIFORNIA
DEPARTMENT OF EDUCATION
721 CAPITOL MALL, SACRAMENTO 95814

January 31, 1973

Honorable Don H. Clausen, Chairman
The Governor's Aerospace-Aviation
Education Task Force
U. S. House of Representatives
Washington, D. C. 20515

Dear Congressman Clausen:

As previously indicated, I am pleased to commend you and offer you my appreciation and that of the California Department of Education for your support of aerospace education in California's schools. Such educational endeavors have materially assisted many of our youths to find careers in air transportation and general aviation.

In this, the air age, it is my firm belief that every California student should be familiar with aviation and aerospace and their contributions to the economic well-being of the State. I am pleased to endorse the concept of aerospace-aviation education at every level of public instruction. I have designated my Associate Superintendent, Dr. Clarence Hall, to head a task force to develop a strategy for implementing aviation and aerospace education as a regular part of the curriculum in the California public schools. In this endeavor we will be working closely with the Department of Aeronautics.

I assure you of my continued warm support for this worthwhile program and pledge the cooperation of the office of the Superintendent of Public Instruction.

Sincerely,

WILSON RILES

Foreword

California has long been recognized as a leader in education, and it is particularly evident that this leadership has extended to Aerospace-Aviation Education. There has been noted, however, a downward trend in the number of programs. While other states have been observed as making great strides in developing new programs and revitalizing existing aerospace-aviation educational efforts, we have found, here in California, a growing lack of support for such efforts. Cyclical changes in the economy have had their effect, particularly in aerospace and aviation – not so much on the students, whose interest level remains high – but on school administrators and on the governing boards of school districts.

An informed citizenry is one of the greatest assets to be sought by this nation, and most assuredly by California. The disappearance of airports, and the mounting attacks on such facilities, have made it all too clear that too few of the state's citizens are well enough informed about aviation and aerospace to understand their implications for all of us and their contributions to the economy of the state and the nation. Because of higher priority commitments, statutory mandates for the encouragement and development of aerospace-aviation education have gone unheeded in many sections of the state. A viable and progressive society relies heavily on communications and transportation for its growth and survival. It has become increasingly obvious that the transportation system must be multi-modal in concept, and must be based on a full understanding of every phase of transportation, not the least of which is air transportation.

The aerospace-aviation industry is one of the largest non-agrarian users of manpower here in California. Employers in that industry are constrained to seek a reservoir of trained manpower or, in other words, to employ the possessor of saleable skills. The development of such skills is one of the major tasks confronting the educational institutions of the state.

With all of the foregoing in mind, and mindful too of the consequences of an uninformed citizenry, Governor Ronald Reagan was quick to respond to the suggestion of Congressman Don H. Clausen (First District, California) that he appoint an Aerospace-Aviation Education Task Force. He did so in 1969.

The purposes and objectives of this task force and the basic reasons for its creation can best be summarized by this phrase: "People must broaden their perspective" if they are to understand life, with all its diversities and complexities, to determine what direction and decisions we, as individuals, must take and make if we are to contribute to the quality of life – here in California, the Nation, and throughout the world.

"We can forgive the child for being afraid of the dark, but the tragedy of our lifetime is when grown men and women are afraid to see the light."

Or, put another way, "When one's head is buried in the sand, the visibility is very restricted."

The threats and dangers of our nuclear age have brought us to a point in history where those people and nations who believe in retaining and advancing the cause of freedom and free institutions can no longer afford to "remain in ignorance" of the great problem-solving capabilities our aviation and aerospace technology can provide for us in the social, economic, political and security fields of endeavor.

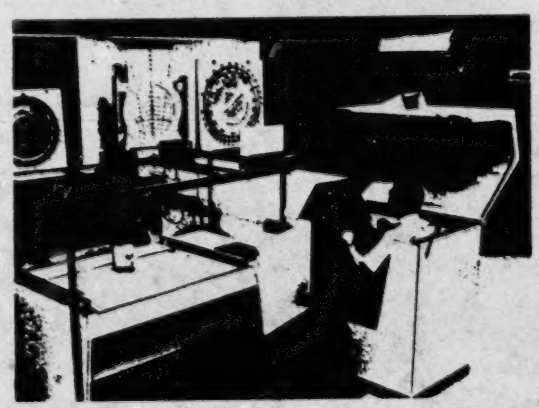
You, as the Governor of California, and our President Nixon, have demonstrated your awareness of this potential through your very effective "airborne diplomatic initiatives" as you attempt to convey to the leaders of the world America's true purpose and intent.

Certainly, you did not transcend the great oceans and land areas of the world in a "rowboat" or a "horse and buggy." You put to use the most modern transportation and communications equipment available in order to "get your message across."

But, in my view, this is just the beginning. We have only scratched the surface. The highest ideals and greatest aspirations of people toward problem solving will never be realized or supported unless they, the people, more fully comprehend how aerospace-aviation equipment and technology can provide solutions to our most pressing domestic and international problems.

The key to our survival and the quality of life we all seek require a reversal of the trends of the past.

Here in the United States, over 70 percent of the people live on only 2 percent of the land. This unreasonable population imbalance has led to congestion of monstrous proportions. It is the prime contributor to many of our most serious domestic



problems – poverty, crime, drugs, ecological abuses, physical and mental pressures, and unmanageable cities.

The key to survival is a more balanced population pattern. This can only be accomplished by more efficient, functional, coordinated, integrated, and balanced transportation systems. An improved and well-planned airport and air transportation system can provide the new dimensions necessary to attain population dispersal and the objectives of a "quality" life.

We, in California, are moving in this direction and can, with an enlightened and cooperative people, become the leader of the Nation. Certainly, our vast aerospace and aviation industries provide us with the capacity for performance.

With the 337 orbiting satellites, many useful results on earth can be attained in the related fields of communications, navigation, weather, land-use planning, earth science, defense and security, earth resources, a national growth policy, disaster relief or prevention, global environment protection, an inventory of renewable resources and transportation system planning, etc.

As the Apollo moon program comes to a close, attention will focus on the more efficient Space Shuttle, Skylab, unmanned exploration programs, as an expansion of the above stated "useful results on earth."

In a statement to the National Goals Research Staff in 1969, President Nixon put our challenges of change in excellent perspective. "We can no longer afford to approach the longer-range future haphazardly, as the pace of change becomes more complex. Yet, at the same time, an extraordinary array of tools and techniques has been developed, by which it becomes increasingly possible to project future trends – and thus, to make the kind of informed choices which are necessary if we are to establish mastery over the process of change."

We, in California, have the "tools and techniques" and the technological talent to make a major contribution – providing we keep pace with the demands and signs of our times.

As a member of Congress, I tend to project my views in terms relating to the National situation. However, as a native Californian, I want my State to be the "enlightened leader" that is rightfully expected of the largest state in the Nation.

This report culminates more than 2 years of effort by the Task Force members in exploring every facet of aerospace and aviation education, ascertaining what problems and opportunities existed, and developing a series of recommendations to the Governor.

The creation of this Task Force, and the filing of this report is a first in the Nation. The real test of leadership comes with implementation of its contents.

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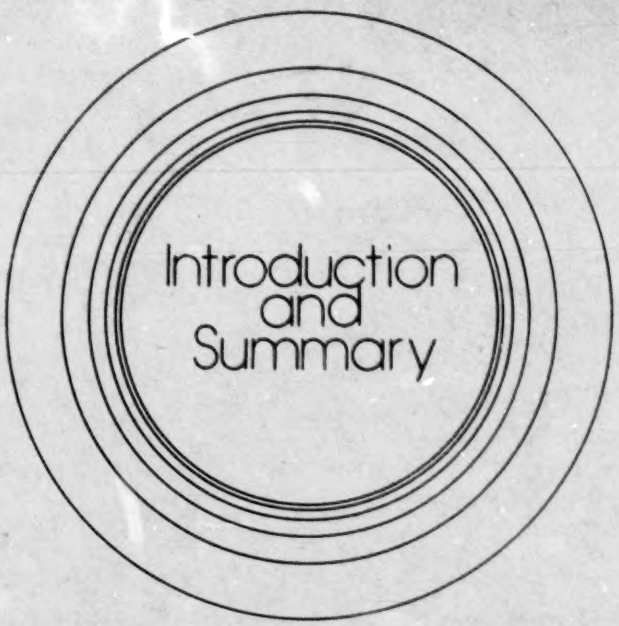

Introduction
and
Summary

Task Force Scope and Objectives

On March 25, 1969 Governor Ronald Reagan appointed a 30-member Aerospace-Aviation Education Task Force under the chairmanship of Congressman Don H. Clausen (First District, California). These ladies and gentlemen were from every aspect of aerospace, aviation, education, and government.[1]

The scope of activities to which the Task Force was to devote its attention was to include, but not be limited to the following:

- To assemble a group of aviation and aerospace experts, scientists, educators, state and governmental representatives to advise the Governor on matters pertaining to aerospace education throughout the schools and colleges of California.
- To study and select pertinent recommendations for the adaptation of space and aviation concepts in the elementary, high school, and junior college levels of the State based upon existing and projected requirements of the aviation and space industries.
- To develop a statement for the governor's possible use in reporting to the Legislature on the needs of education and training in aviation and space sciences based upon the opinions of the Statewide Aerospace Education Advisory Committee to the State Superintendent of Public Instruction, and all other organizations with particular concern for education in these fields of endeavor.
- To learn enough about existing aerospace and aviation education programs to make recommendations for the use of such programs as models or changes that should be implemented to strengthen them.
- To prepare a statement of economic implications of aviation and space sciences for the State of California to be distributed to all educators assigned the task of curriculum preparation and evaluation.
- To confer with the State and Federal agencies assigned aviation education responsibilities, learn about the obstacles confronting implementation of appropriate programs and recommend solutions to these problems.
- Due to the combination of Intrastate, Interstate, International, and Intercontinental nature of air travel and traffic operations, future activities will require participation and coordination with other State aerospace education councils, the Federal Aviation Administration, and the National Aerospace Council Conferences that must inevitably evolve as we keep pace with the rapidly changing technological factors in aerospace and aviation enterprises.

Organization

Because Chairman Don Clausen would be in Washington so much of the time in his capacity as a member of Congress, it was determined that the Task Force must be organized for management and continuity of effort. On May 17, 1969 the Task Force held its first meeting at San Jose State College during the "Aerospace 70" program, and at that time devised an organizational structure. To assist the Chairman, Mr. H. Gene Little, Vice President for Education for World Airways, Inc., was designated Vice Chairman. Joseph R. Crotti, California's Director of Aeronautics, was selected as Secretary to the Task Force, while Mr. Elmer Haskin was chosen to perform congressional liaison. To facilitate a geographical division of the effort, a number of directors were also selected. Among those so appointed as directors were Miss Harriet G. Porch, an editor and writer for the Rand Corporation; J. Floyd Andrews, President of Pacific Southwest Airways; Dr. Myrl C. Rupel of the Tehachapi School District; and Thomas E. Leonard, Chairman of the Aeronautics Department of San Jose State College.

In addition to this organizational framework, it was determined that the best method of approach to the problems could be realized through a committee structure, with each committee concentrating its efforts on a particular segment of the educational field. Committees chosen were as follows:

1. Elementary and Junior High Schools
2. High Schools and Community (Junior) Colleges
3. Colleges, Universities, and Private Schools
4. Industry-Professional

It was inevitable that some Task Force members would be involved with, or serve on, more than one of the committees.[2] To afford depth to its findings and recommendations, the Task Force committees also sought assistance from a number of advisors.[3] Cooperation was sought from and furnished by Dr. Max Rafferty, the then Superintendent of Public Instruction; Glenn S. Dumke, Chancellor of the State Colleges; Charles J. Hitch, President of the University of California; and Sidney W. Brossman, Chancellor of the Community Colleges. Each of these gentlemen, in response to a request from Governor Reagan, designated members of his staff to furnish advisory assistance to the Task Force and its committees. The invaluable contributions of these advisors were many and varied. Each had his or her own particular insight into the problems, capabilities, and resources affecting one or more educational sectors.

1. For a listing of Task Force members, see Appendix.

2. For the committee structure, see Appendix.

3. A listing of advisors is furnished in the Appendix.

Recommendations

In the course of its work, each of the committees has developed recommendations. Obviously, what may be appropriate for the Colleges may not fit the elementary school situation at all. The problems at the various levels are different, and so too are the solutions. For that reason, the recommendations of the Task Force will be found in the body of this report, as well as at the end of this introduction.

There were a few general recommendations, one of which was that aerospace education must be made available to more of our students, at every level of education. Another, which pervaded most of the committee reports, was that aerospace-aviation education classes must be legitimatized. A suggestion was offered that flight courses should be scrutinized in the light of what they contribute to the development of the whole student. One question asked about aerospace-aviation education was: "Is it not at least as valid an educational experience as the art class, the drama class, or the track class?" The answer was a resounding "Yes." Another of the general recommendations was that present courses should be refined.

Need

There is a need today for a mechanism for translating the future into the educational implements of the present in our nation's schools. Aerospace-aviation education can be one of those mechanisms. This new educational discipline could be actively utilized by our schools – not for reaching the moon – but to reach for the inside of students' minds.

In the full realization that aerospace-aviation is perhaps the largest nonagrarian user of manpower, it is abundantly clear that adequate preparation is required if our young people are to assume their responsibilities when they leave our schools. Today's third graders will be the new employes of industry in the 1980s. With the economic activity in aviation expanding many times faster than the percentage growth in the total gross national product, it is imperative that the schools adapt to the needs of the times, develop flexibility, and include in their offerings to pupils a study of the life into which those pupils will move. Where yesterday's schools taught Greek, today, driver education is pertinent. Tomorrow, aeronautical training may be mandatory. There is little doubt about the need for aviation and aerospace education in today's schools, if only to inculcate in the student an understanding of the complexities of the existing and rapidly expanding air age.

There is also an urgent need for schools to really educate their students. Students must learn how study, how to read of their own volition, and how search and research beyond minimum assignmen There are few subjects which arouse this prim drive in students, but aerospace and aviation scien do. Motivation is essential in any learning proce and aerospace and aviation are proven motivat today.

At the elementary and junior high school lev the primary value of study in aviation and aerospa is based on its inherent ability to give our you people a sound basis for understanding the wo around them, and to build a foundation of interest young students who will later be able to assu responsible and meaningful roles in the mode community. Aviation studies at this level facilita the development of good study habits simultaneous with the attainment of knowledge. According Frank Mitchell, Cessna Aircraft Corporation's Man ger for Education, aviation studies can be used motivate learning in as many as 18 subjects, such mathematics, science, English usage and communic tion, history, economics, etc., and can serve stepping stones to good citizenship and stude effort. Should the student later choose to work in th aviation industry, he would already have develop the basic aeronautical knowledge to assist him further specific learning in aviation and aerospace.

There is a need for, and a very definite dema for relevance in the curriculum of today's schoo The State of California is in a position to encourag coordinate, and finance an educational program the elementary and junior high school levels, design to motivate the child, to make learning relevant, an to build into the student – the citizen of the mode world – an understanding of that world. "... avi tion and aerospace activities are yesterday's drea today's frontier, and tomorrow's life."[4]

In the broadest sense, the aeronautics student c become the educator and carry the message of th true contribution of air and space travel to the enti community. Not to be dismissed lightly is the ne for an objective presentation of all data relating aviation and aerospace ... from ecology to sociolo and engineering.

Aviation and air transportation in general play dominant role in the movement of goods, service and people throughout the State, the Nation, and th World. The rapidly growing and changing aspects aviation and aerospace, and their effect on th economy and society as a whole, increase th necessity of having the State's citizens become ful aware of the roles that each segment of transport tion plays. We need to foster this awareness an understanding, and this may best be accomplishe through planned educational experiences in th

4. *Teacher's Guide to Aerospace Scie ce*, published by t Lincoln, Nebraska Public Schools in the summer of 196

State's school system. A clear need is evident for an objective re-evaluation of existing aerospace-aviation education in California's schools, with an eye toward implementing aerospace-aviation education at all levels to meet the future challenges of the high-technology industries.

There is a need to eliminate some of the educational anachronisms with which California is plagued. Some of those anachronisms which it is hoped can be eliminated are enumerated as follows:

> Sixty percent of all California high school pupils obtain inadequate or no occupational training. Although high school graduation formally terminates education for 54 percent of all students, vocational or technical training is available for only 10 percent of the high school population.
>
> Pupils intent on obtaining occupational training are forced into a rigid, compartmentalized and stigmatizing vocational track.
>
> The Community or Junior Colleges and the State Colleges similarly fail to meet the needs of the majority of students. Eighty percent of Junior College students drop out.[5] According to Burton Clark, a large share of these youths are pushed out.[6] Fifty-four percent of all students who make it to the State Colleges drop out. Of those who make it to the University, overall one-third fail to earn a four-year university degree.
>
> Despite the fact that only one of every five high school pupils obtains a four-year college or university degree, – and despite the fact that only 12 percent of all nonseasonal jobs require a college or university degree, – a lock-step, academic curriculum dominates the so-called comprehensive American high school. Teaching methodology, school organization, and deployment of resources are controlled by the dead-hand university-academic ethos.[7]
>
> . . . the comprehensive high school, as presently constituted, fails to prepare students for college; and rapid technological changes have rendered the curricular offerings of the secondary school irrelevant to industry. Unable to transfer about the labyrinth of higher education in search of a suitable institution and hospitable major, and financially incapable of postponing involvement in the job market, disadvantaged youths especially find themselves in a condition of desperate nonpreparation while in their late teens or early twenties. In the past, it was easier for counselors to shunt minority youths into an outmoded shop curriculum which offered no preparation for real-world trades, where they were made to feel inferior for being in noncollege, low-status courses . . . Clearly, the gap between aspirations and social reality is frightfully wide. The failures of the educational system weigh heaviest on disadvantaged, minority-group youths.[8]

Another commentary on vocational or career education is reflected in the following:

> There is a need for competent citizens in the fields of management, administration, operations and maintenance. We need the engineers, the designers, the transportation specialists, and above all, we need the generalists – that is – those who have a degree of familiarity with many aspects of aerospace-aviation, and who can blend aviation into an integrated system to accommodate movement. For movement is the essence of modern communication and the exchange of ideas. . . . What is required is quality in education, delivered by those competent to impart the knowledge . . .[9]

Dropout Statistics

To say the very least, any citation of statistics about the dropout problem immediately becomes the target of criticism. It would appear that a certain amount of controversy in this area is a natural fallout from the lack of adequate documentation. There is no commonly agreed upon definition for dropout. It would appear that each authority develops his own statistics. Considerable research has been expended in this area, however, and a look at some of the findings might well be appropriate at this point. The January 1, 1971 report of Governor Reagan's Commission on Educational Reform, states in part:

> The great American dream of having every student graduate from college has not proven realistic, as is evidenced by the percentage of residents, age 18 or older, who in fact graduate from college in California: AA Degree – 15 percent: BA Degree – 9 percent; MA Degree – 3.2 percent. . . .

Some authorities accept the term dropout as applying only when the student has dropped out of college two or more times. Poor returns from questionnaires, and inadequate samplings have resulted in different claims of dropout rates as low as 18.6 percent, and as high as 80 percent. It should be obvious that dropout rates may well vary at different schools.

In a 1971 report, Dr. O. B. Nereson[10] summarized statistics for the 2300-member freshman class of 1965 at Foothill College. Excerpts from his report are furnished below:

> While nearly three quarters of all freshmen at Foothill Community College in Los Altos say they want to go on to a four-year college or

5. Statistics and percentages are controversial.
6. Burton Clark, *The Open Door College.*
7. Quotations from *Learning Through Aviation,* the Richmond School District, Richmond, California, 1969.
8. Ibid.
9. Remarks from an address by Governor Ronald Reagan to the members of the Task Force, June 16, 1969.
10. Dr. O. B. Nereson, *The Educational Ventures of 2300 Freshmen,* a report.

university after graduation, less than a third actually make it . . . The community colleges are really doing the lower division (freshman and sophomore) work . . . Nearly 72 percent of all freshmen and sophomores are attending 92 junior colleges in California, while slightly more than 12 percent attend State Colleges, and 15 percent go to the University of California or private schools. Yet, according to the report, most of the students who enter junior colleges leave before they earn a bachelors degree.

Out of the 2300 members in the 1965 Foothill class,

. . . Thirty percent ultimately transferred to a four-year college or university. A total of 38.5 percent of these received a bachelors degree or higher in the last three years. Some are still enrolled . . . Some 15 percent of the students received a two-year Associate of Arts degree. Eight percent took two years; five percent took three years; and two percent took five years to complete the work . . . About another six percent completed enough of a "career" program to get a job. Ten percent of the class transferred to other junior colleges where some have attained a definable goal. Thus, about 51 percent of the class reached a "minimum for employment part of a defined goal." *The remaining 49 percent dropped out.* Some returned to school later, and some may have completed junior college work . . .[11]

Dr. Hugh H. Semans, president of Foothills College, was quoted in the Enterprise-Record of Friday, October 15, 1971, as follows:

The problem is, how do we get people from the realm of myth – that everyone should have a full college education – to the realm of reality? . . . the study showed that of 2308 students surveyed, *20 percent dropped out by the end of their first semester, and nearly half had left by the end of their first year* . . . more students should be in the 57 separate *career-oriented* programs offered by the two schools in the Foothill Junior College District.[12]

In the late spring of 1967, a statewide survey on vocational guidance was conducted by Dr. Gerald H. Shaw. The results of the survey were published in a doctoral dissertation by Dr. Shaw at the University of California at Los Angeles. Seventy-eight junior colleges in actual operation at the time participated in the study, which was endorsed by the California Junior Colleges Association and the State Department of Education. A 92 percent sampling produced data summarized from returns by personnel and instructional administrators, as follows:

. . . 35.2 percent of their respective college enrollees with initially stated transfer objectives actually do transfer . . . This result closely parallels the statistics quoted by many experts who say that *while two thirds of junior college students proclaim a transfer goal, only one half of these actually do transfer.* Dr. Shaw's report reveals that according to the average ratings based on estimates by the junior college administrators, *41.8 percent of their enrollees with transfer objectives drop out either before graduation or transfer. Similarly, a 42.9 percent dropout rate was the mean* of the distribution of averaged ratings by the above group for enrollees with stated terminal occupational objectives . . . an average of 22.3 percent of the students switch their enrollments from transfer programs to occupational programs. On the other hand, the combined average of the institutional averages was 11.1 percent of students in the reversal of the previous situation, who initially were enrolled in terminal occupational programs and switched to transfer programs . . . Among the conclusions reached in Dr. Shaw's dissertation: "a critical requirement exists for effective vocational programs . . . significant improvements in these programs in California will require considerable money, trained manpower, leadership and coordinated effort."[13]

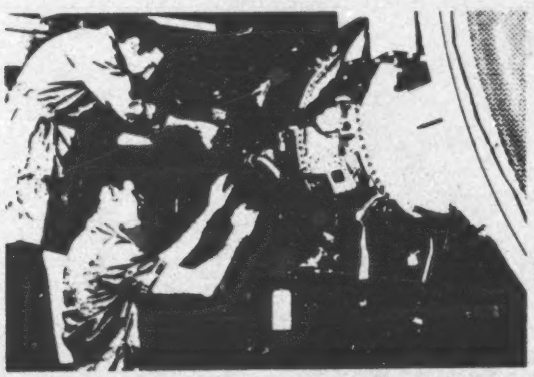
Three researchers used a $9200 grant from the Department of Health, Education and Welfare during a two-year study at the College of San Mateo, culminating in May, 1971 with the finding of "*. . . high dropout rates – as high as 50 percent at the end of the freshman year* – have been a continuing concern of California's community colleges where the "open door" policy means they must accept any high school graduate or 18-year-old who applies." The study centered around the College of San Mateo's Learning Center, and involved testing to identify potential dropouts in 3200 first-time, full-time students planning to enroll in the College in the fall of 1970, followed by counseling in attempts to stem the dropout rate.

Whatever the actual dropout rate, it is cause for considerable concern on the part of school authorities, so much so that Evan Maes, head counselor at Pierce College in Woodland Hills sought a $5000 grant to conduct a pilot program to test prospective college enrollees to determine true motivation and ability. "The dropout rate at community colleges throughout California has reached an alarming average of 20 percent. At Pierce College in Woodland Hills, the rate is even higher. Last year, 24 percent dropped out. College officials and trustees understandably are concerned. So are parents and taxpayers who provide the $89.7 million appropriated this year to educate nearly 100,000 students in the Los Angeles district's eight two-year colleges."[14]

11. Robert Hollis, *A Report on Junior College Dropouts*, ENTERPRISE RECORD
12. *Save-College Dropout Study Set at Los Altos Hills* ENTERPRISE RECORD October 15, 1971, Page 7B.
13. Kenneth A. Wood, Consultant, Pupil Personnel Services, Bureau of General Education, the California Community Colleges, *Vocational Guidance*, a report, Sept. 1968.
14. Editorial, LOS ANGELES TIMES, *Reduce Community College Dropouts*, undated.

Summary of Task Force Recommendations

1. Currently available written materials should be reproduced and made available to all school districts. This reproduction should be on a selective basis, choosing the best available materials.
2. It is essential that the sections in the Education Code which deal with Aerospace-Aviation Education be fully implemented.
3. On the basis of knowledge about aviation and the uses of aviation to motivate students, potential teachers in teacher-training institutions should be afforded an orientation in aviation and aerospace.
4. Teachers currently in service should be afforded workshops and training sessions, properly organized, and financed by State agencies.
5. A program of insurance for schools and colleges for liability coverage when providing educational flight experience to pupils should be established.
6. Those teachers who are currently licensed pilots should be encouraged to use aviation in their classroom situations.
7. Maintain close cooperation and liaison between the schools and aerospace industry so that the information and concepts taught in the schools are in line with current and projected industry goals and needs.
8. Establish a priority for the development of a low-cost, manipulative flight simulator for use in those schools where there has been encountered a lack of parental acceptance of flight experience for pupils.
9. Encourage and maximize cooperation with private, fixed-base operators and flight training centers. Utilize their facilities and personnel whenever possible in the flight instruction, cross-country and airframe powerplant maintenance categories of instruction.



10. Encourage school districts to work with interested aviation bodies or groups in their community. Bring into the classrooms local speakers who are knowledgeable about aviation and aerospace. Some sources of expertise are: Local Fixed Base Operators, Flight Schools, the Federal Aviation Administration, the California Department of Aeronautics, the Aircraft Owners and Pilots' Association (AOPA), the Airline Pilots' Association (ALPA), the Air Transport Association (ATA), the Flying Physicians, the Flying Farmers, the Ninety-Nines, the Civil Air Patrol, etc.
11. Establish, and appropriately fund, a position within the California Department of Aeronautics, to advise on and coordinate the aerospace-aviation activities of the various educational entities throughout the State.
12. Establish four-year aerospace-aviation courses at more of the State colleges, to encompass business, science, airframe and powerplant technology, flight, etc.
13. Standardize curricula. (Until majors are offered in aeronautics or aviation at more of the State's colleges, it is difficult for the community colleges to standardize their curricula. Once standardization is accomplished, the problem of transfer credits, in other words, articulation, will be eliminated).
14. Encourage industry to offer incentives to students entering upon programs to fill the needs of industry.
15. In the State's Schools of Medicine, place more emphasis on aviation medicine. In high schools and in the other colleges, utilize aviation medicine concepts to stimulate students in a host of health-related areas.
16. Provide funding to facilitate further research and exploration into the possible advantages of incorporating aviation programs in the school curricula, to captivate and retain potential school dropouts and the under-achievers.
17. State College Trustees should be urged to encourage the incorporation of flight activities appropriate to the curriculum. Provide a correct interpretation of the Executive Order on student air travel. (This order is frequently and incorrectly interpreted as imposing sanctions against student flight activities).
18. For the elementary, junior high school, and high school levels, we recommend that aviation education be incorporated into the curricula of the State's schools; that this concept be endorsed by the State School Board; and that appropriate text books be selected for each educational level.
19. Organize and establish teacher-oriented programs, either as workshops, or as classroom activities, so

designed as to facilitate the uses of aerospace-aviation in imparting a broad spectrum of traditional knowledge (and not specifically restricted to vocational orientation) to the student. Exercise due care to avoid concentrating solely on the science aspects; rather, keep the programs as comprehensive as is practicable.

20. Offer continuing education, counseling, and/or retraining at the State's colleges and universities for present employees in the aerospace-aviation industry. Offer support, encouragement, and coordination on a statewide basis.
21. Develop all possible sources of funding so that laboratory programs can continue to be adequately supported. Assist the Colleges and Universities financially in the maintenance of equipment, or in the replacement of those units which are obsolescent.
22. Encourage the colleges and universities to develop new programs in aviation and transportation, multi-modal in their approach, and multi-disciplinary in design.

Referring to recommendation 8, above, the Task Force strongly encourages the use of unsophisticated flight simulators in the elementary schools, and the commercially developed, more sophisticated flight simulators for high schools, community colleges, universities, and in adult education aviation programs.

Introduction

Aviation and aerospace are deeply rooted in the history of California, and have played an important role in the economic, social, political, and educational development of the State. The following facts are cited as examples of this heritage:

1. California ranks first among the States – in total numbers of:

- o Aircraft registered — 22,473 eligible aircraft as of September 30, 1972.
- o Pilots registered — 106,128 as of December 31, 1971.
- o Landing facilities — 804 Airports; 177 Heliports; 12 Seaplane bases.
- o Operational Helicopters — 724 as of July 1970 – one out of every 6 in the nation.
- o Non-pilot Airmen — 16.99% of the national total.
  18.08% of the mechanics.
  13.34% of the parachute riggers.
  13.90% of the ground instructors.
  12.37% of the dispatchers.
  11.32% of the control tower operators.
  38.44% of the flight navigators.
  18.53% of the flight engineers

2. California schools are credited with having the first flight training program in public schools, beginning in 1925 in Galt. The program operated successfully for many years after merging with a junior college aviation program in 1926.
3. Reedley College, in Reedley, California, reported one of the earliest known state programs in the 1920's.
4. A physics teacher at Los Angeles Polytechnical High School incorporated aviation education in his class in 1929.
5. Sacramento City College and The College of San Mateo began instruction in aeronautics in the 1930's.

This evidence of educational acceptance of aviation runs contrary to the usual experience; that is, that usually from 30 to 50 years elapse between the conceptualization of a valid educational idea and its adoption into the curricula of schools.

In 1969 there were 1156 school districts in the State of California. Department of Education records indicate that there were a total of 266,700 graduates from the State's public high schools, and 45,209 from the community colleges. The Population Research Office, located in Sacramento, estimated that approximately 60 to 65 percent of the State's high school graduates go on to colleges of one type or another.

The national census of 1970 revealed a California population of 19,953,134. For the same year, enrollment statistics for our public schools and community colleges revealed the following figures for the various educational levels:

Kindergarten	356,370
Grades 1-8	2,821,988
Grades 9-12	1,262,566
Community Colleges (13-14)	367,441
Totals	4,808,365

In addition to the public school figures, there were considerable numbers of pupils in the non-public schools. Those figures, by level, are:

Kindergarten	14,636
Grades 1-8	307,521
Grades 9-12	97,941
Totals	420,098

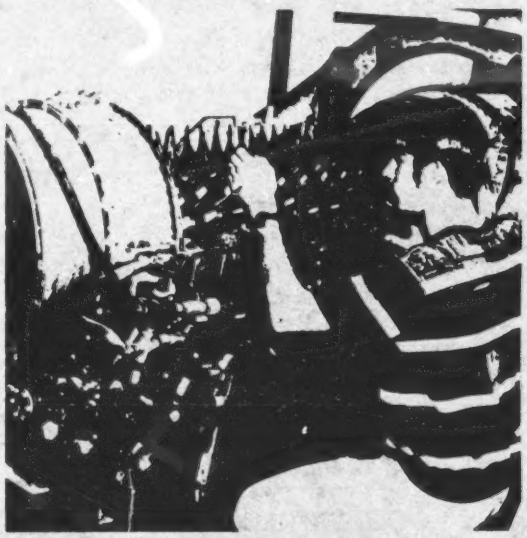
At the nine University of California campuses (Berkeley, Davis, Irvine, Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz) there were additional 106,759 students. The 20 State Colleges harbored another 246,725 students. The State's private colleges enrolled 117,891.

Almost 29 percent of California's 19,953,134 population were attending the State's schools, colleges, and universities:

Public Schools and Community Colleges	4,808,365
University of California	106,759
California State Colleges	246,725
Private Schools	420,098
Private Colleges	117,891
Total	5,699,838

13

$$\frac{5,699,838}{19,953,134} = 28.566 \text{ percent}$$



Economic Impact

The Western Region of the Federal Aviation Administration includes some of the largest aircraft manufacturers in the world – and most of those are right here in California: McDonnell Douglas, Lockheed, North American, Convair, AiResearch and Ryan Aeronautics. The payrolls of these firms are of considerable significance in the economic condition of the State. Of even greater significance, however, is the cascading of benefits into allied industries, such as the suppliers of raw materials, the many components which go to make up a modern aircraft. On top of that, the contributions of the State's airports are even greater. A news release dated November 1, 1971, revealed that "... The three airports in the San Francisco Bay Area pour over $1 billion each year into the area's economy." The three airports – San Francisco International, Metropolitan Oakland International, and San Jose Municipal – employ close to 30,000 people, and provide a payroll of some $322 million per year. Most of this employment – some 26,000 – is the airline employees. The rest – about 3500 – are employed by concessionaires at the airports, or by the airports themselves, or by agencies of the Government (Federal, State, Local).

The 29,417 jobs at the airports support a total of some 68,000 people in the San Francisco area, including the workers themselves and their families. The airlines and other businesses at the airports contribute almost $20 million annually in taxes to the area and buy over $140 million in fuels, materials and equipment from Bay Area merchants.

Airport employees and their families spend some $71 million per year for food, $80 million for housing, and pay more than $38 million in taxes each year. The study from which these figures are cited, proves conclusively that the airlines and airports are necessary and vital to the economic prosperity and growth of the Bay Area.[15]

The study, of course, dealt only with the three major airline airports in the Bay Area, and did not even consider the other busy airports – the General Aviation Airports, such as Palo Alto, Reid-Hillview, Hayward, Livermore, San Carlos, and Buchanan – or the military airports like Crissy Army Airfield, Alameda Naval Air Station, Moffett Naval Air Station, Hamilton Air Force Base, and Travis Air Force Base – all of which have significantly large work forces.

In San Mateo County, better than one out of every eight employed persons is in some way connected with the aviation industry. In San Bruno, the home of Skyline College, the ratio of aviation-connected employment is even higher.

15. Air Transportation Association economic report, Nov. 1, 1971.

Los Angeles International Airport injects more than $3.3 billion annually into the economy of five counties – Los Angeles, Orange, San Bernardino, Riverside, and Ventura. Payrolls at Los Angeles International Airport in 1970 totaled $1,437,300,000. Local purchases accounted for $256,200,000 in materials and services. Local taxes paid by employers amounted to $25,300,000, and air visitor expenditures totalled $1,587,000,000. By 1975, the airport's economic impact will increase to $4.5 billion, and by 1980 to $5.5 billion. Total direct, indirect, and secondary employment generated by industry connected with Los Angeles International Airport was listed as 101,688 persons in 1970. Of that number, 37,076 employees worked at the airport or in support of operations for airlines, concessionaires, aircraft service companies, air freight forwarders, or government agencies. These employees accounted for a payroll of $447.6 million in 1970. Almost 29,000 – or 78.2 percent – were employed by the airlines, while the remainder were about equally distributed between other airport business and government agencies.

The track record is clear. There are career opportunities in aerospace and aviation, but such opportunities must be exploited if we are to make the most of them. We do not seek to indict California alone for its inadequacies, for such things apply across the nation.

> Aerospace employment will continue to rise, but aviation education isn't keeping pace with the demand for technical maintenance personnel, two aviation association officials told the Aviation Technician Education Council meeting in Boston Friday.
>
> Joseph L. O'Brien, Vice President – personnel relations of the Air Transport Association of America, cited an Arizona State University study on training skilled aviation personnel which said the airlines will need more than 95,000 new mechanics between 1965 and 1980. General aviation will require about 138,500 new mechanics during that period.
>
> "... The aviation industry is on the threshold of what might be termed a 'quantum leap' in growth," quoted O'Brien. "Unfortunately, no comparable prospect of a 'quantum leap' in aviation education can be anticipated from the existing aviation education structure and its present capability."
>
> A recent survey by the council of some 30 aviation technical schools indicated that enrollment is increasing. The number of students in full-time airframe and powerplant courses more than doubled between 1962 and 1967 – up from 2380 to 5000. Enrollment by 1972 is expected to

be 8725 – up 74.5 percent. The survey showed that of 2555 licensed graduates in 1967 (from such A&P courses), 45 percent went to work for the airlines; 20 percent were hired by manufacturers; about 19 percent went directly into military service; and some 10 percent accepted employment not related to aviation.[16]

In 1979, there will be nearly 300,000 FAA-certified aircraft mechanics, compared with the 1966 total of 141,000, Gerson Chanowitz, Aerospace Industries chief economist, told the ATEC members. Chanowitz predicted that aerospace employment will continue to rise and said "requirements for mechanics look particularly good in coming years." The average aerospace mechanic will earn $4.13 per hour or $165 for a 40-hour week this year (1968), according to Labor Department estimates . . . Of every hundred persons employed in the aerospace industry today, Chanowitz said, 17 are scientists and engineers, seven are technicians, 54 are production workers, and 22 white collar workers. Last December (1967) 96,000 technicians were employed by aerospace firms.[17]

Lest one be misled into believing that these forecasts are on the rosy side, let us look at the actual numbers of FAA-rated mechanics as of December 31, each year from 1961 to 1970:

1961	118,689	1966	140,792
1962	122,160	1967	146,572
1963	124,945	1968	158,211
1964	130,131	1969	170,716
1965	135,351	1970	184,647[18]

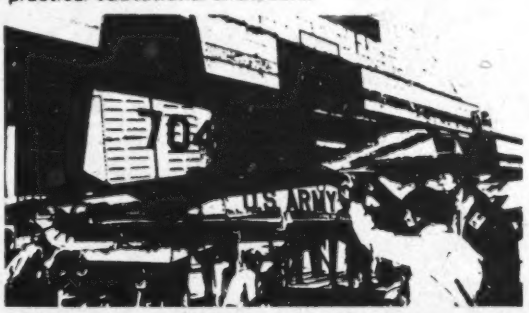
Above all, we caution against the pitfall of falling prey to the boom and bust cycle. We have witnessed a recession in some sectors of the aerospace industry. Inevitably, as we wind down from an economy geared to the Vietnam war, there will be some displacements and some retraining of personnel into other lines of endeavor. All signs, however, indicate that we have turned the corner and are on the mend economically. The future belongs to those who prepare for it, and those with an inadequate background in aviation and aerospace will find themselves out of step with the future.

It is time now to turn to the findings and recommendations of the various committees of the Task Force. The reader should recall that the Task Force was composed of 30 ladies and gentlemen. As might be expected, there were many individual opinions expressed. This report attempts to express a consensus in each of the major areas.

One principle to be borne in mind is that while State guidelines *are desirable*, local control and accountability are governing principles.

16. AVIATION DAILY, April 23, 1968, Page 271.
17. Ibid.

At the Task Force's organizational meeting in San Jose, during the "Aerospace-70" program, Governor Ronald Reagan sent his greetings, delivered by Joseph R. Crotti, California's Director of Aeronautics. He began by saying that one of the tasks facing the Task Force would be to see that our young people have the opportunity to learn all of the fascinating facts of life as it is in this, the Air Age. He indicated that with the present and anticipated rates of growth in aviation and aerospace, our scholastic institutions must produce graduates who are knowledgeable, and who are capable of assuming a productive role in our modern civilization. In continuing to speak for the Governor, Mr. Crotti assured the Task Force that the Governor and the Department of Aeronautics would support their every effort in the hope that it could assist our young people in their participation in meaningful and practical educational endeavors.



On June 16, 1969, Governor Reagan personally met with the Task Force and indicated the direction he felt their efforts should take. The Governor spoke briefly, welcoming the group, and thanking them for taking the time to work on the Task Force. For the gist of the Governor's remarks, a summary is included in the Appendix to this report. Following his remarks, the Governor publicly recognized six colleges and five high schools for the excellence of their aerospace-aviation education programs. As the Governor explained, "From the more than 140 high schools and colleges, we have selected 11. These 11 are typical and their honor should reflect on the others who were not selected this time . . ." The 11 institutions were:

Anderson Valley High School, Boonville
Aragon High School, San Mateo
Elk Grove Senior High School, Elk Grove
Redondo Union High School, South Bay
Richmond Unified School District, Richmond

California State College, Long Beach
College of the Redwoods, Eureka
College of San Mateo, San Mateo
Glendale College, Glendale
Mt. San Antonio College, Walnut
San Jose State College, San Jose

18. *1970 U.S. Civil Airmen Statistics*, Department of Transportation, Federal Aviation Administration, June 1971, Page 4, Table 1.

On September 19, 1969 Governor Reagan issued a proclamation to the effect that the year beginning with the opening of California's schools in September 1969 was to be *Aerospace-Aviation Education Year*. The proclamation urged educators at every scholastic level in the State of California, and in every field of study, to (1) enrich their own courses with aerospace-aviation material, (2) inform their students of the depth and breadth of career opportunities in aerospace-aviation – already the largest nonagricultural industry in California, (3) develop insights into the vital social factors involving aerospace and aviation with the lives of all Californians, (4) seize every opportunity to translate the excitement of our success in the moon landing to optimism for finding solutions to our pressing problems on earth, and (5) prove again that cooperation is the best weapon against confrontation. For the full text, see the Appendix to this report for a copy of the Governor's Proclamation.

Elementary and Junior High Schools

At the elementary school level, aerospace is not taught per se, but rather is used to assist in the accomplishment of the school's real task — that is, the inherent interest in aerospace and aviation i. ed to help achieve the school's objective. The chief justification for using aerospace education in the elementary school is that it is a proven vehicle to motivating the teaching and learning process in the 3 R's, or in acquainting the pupil with the broad areas of vocational opportunity.

Although there are many fine classes in aerospace and aviation in some of the nation's schools, particularly here in California, there are also what might be termed maverick programs. Then too, no pattern has been agreed upon as to how the effectiveness of any and all programs, and their relationship to the overall educational values, are to be measured. Objectivity, funding, geographic areas, personal attitudes and backgrounds, changing manpower requirements, educational priorities, and legislation — all must be considered. Unless, however, some leadership and guidance are offered soon, there is the possibility of a great number of different programs being instituted without any particular direction or protection for the continuing student.

A basic objective of the educational process, particularly at the elementary and junior high school level, is to emphasize the importance of knowledge and the acquisition of certain related attitudes and skills so that the individual student becomes discriminating, productive, and enlightened. The best avenue to accomplishing this basic objective is the curriculum. The curriculum of the school is influenced by numerous factors, but it is the classroom teacher who is primarily responsible for developing the curriculum and for incorporating that curriculum into the day-to-day activities of the classroom. Those teachers who are themselves knowledgeable about aerospace-aviation developments have been observed to utilize their understanding in their classroom teaching-learning processes.

A number of psychological surveys have revealed that most people are insecure when dealing with subject content and materials that are new or unfamiliar to them. This would appear to suggest that when new subject matter is to be introduced, the teacher must be supplied with appropriate training, materials, and the encouragement to proceed, in order to make the task as successful as possible. The Task Force Committee found no evidence that teachers throughout the California school system have any formal mandate, at this time, to include aerospace or aviation content or experiences in the curriculum. Where such topics are found in the school, it is usually the result of the teacher's own interest and enthusiasm, or as a consequence of the teacher's voluntary attendance at one of the summer aerospace-aviation education workshops offered each year in one or more of the State's colleges or universities. There is no existing system for recording or calculating the amount or extent of such incidental aerospace-aviation education which is on-going in California's elementary schools. The Task Force Committee concludes, however, that even greater emphasis must be placed on aerospace-aviation education at the elementary level if the objectives of the school are to be met.

In 1960, the California State Department of Education published a booklet entitled *Aviation Education and the Space Age*. This booklet was prepared by W. Earl Sams, Consultant in Secondary Education, and the foreword to that publication presented views which are just as important today as they were in 1960. The following is extracted from that foreword:

> The educational programs offered by California public schools are constantly being redesigned to meet needs that have arisen and needs that will arise in the future. Among the needs that have arisen are those created by man's conquest of the air. Among those that are beginning to arise and that will arise in the future are those created by man's efforts to explore and to conquer space.
>
> In each of these instances the public schools have responded quickly and with merit. At present, the elementary school program provides opportunity for pupils to become informed regarding airplanes, air transportation, and many of the related problems; the programs offered by the high schools, junior colleges, and state colleges provide similar opportunity for all students and special opportunity for students who wish to pursue careers in the field of aviation. The science and mathematics programs for the various levels of education are being extended and strengthened as required to meet the need created by man's venture into space. The schools must, however, continue to move forward in each instance . . .[19]

19

The inherent interest of the student in aviation and aerospace may be built upon to stimulate learning. For example, aerospace education at the elementary and secondary level enables young people to master arithmetic and higher forms of mathematics, science and history, as well as the communications skills of writing and speaking. It enables the student to obtain an understanding of shapes and the

19. Foreword, *Aviation Education and the Space Age*, California State Department of Education, Sacramento, California, 1960.

practical application of mathematics and science. In some schools, aviation or aerospace is fused with other subject matter, while in others it is offered as an elective science course. The successful teacher is continually called upon to provide experiences that help the student to understand the world around him. Much of the classroom activity is devoted to current affairs, and since air travel is available to *every* student, transportation interests are assisted by the logical inclusion of aerospace-aviation topics. Vocabulary building is another of the benefits to be derived from aviation education; for while aviation and aerospace are commonplace to the adult, they are not so for the student, who must be introduced to and made familiar with aviation terms. Just as the student of earlier days learned of railroads, or ocean liners, their history, development, and contributions to civilization, the modern-day student must learn the history, development and contributions of aviation and aerospace to his world. As he enters high school, his interest is quickened as he learns more of the exciting aspects of aviation and aerospace, with possible career implications for the future. Such introduction and familiarization have particular significance for the underprivileged children from minority races or ethnic segments, where the family life is not such as to encourage mental development and an awareness of the life around them. Manual skills may be developed through the construction of aircraft or satellite models, and many successful programs are based on such projects.

Pacific Southwest Airlines, one of the California-based commuter lines, has provided to schools a kit designed to stimulate interest in and understanding of airline operations, business methods, profit and loss concepts, corporate structure, stocks and financing methods and similar topics. Even if the student never associates with aerospace or aviation, the understanding he gains through use of this type of educational aid will pay him dividends when he enters more advanced studies or the business world.

Most successful educational efforts are based on affording due consideration to certain basic principles of learning. These are often so well understood by the educator that they are taken for granted. Unfortunately, however, they are sometimes ignored in curriculum development. Each of the following has considerable relevance to aviation and aerospace education:

1. Pupils learn best when the information and skills being studied are associated with purposes that are interesting and meaningful to the pupils.
2. Pupils learn best when they have opportunity to learn through actual experience.
3. Pupils learn best when generalizations and abstractions are related to their own experiences, and facts are presented as interrelated parts of problems the pupils understand and wish to solve.
4. Pupils learn best when they have frequent opportunities to evaluate their progress and to determine next steps.[20]

To relate each of these basic principles of learning, the Task Force Committee finds that the student *is* interested in aviation and aerospace. He *is* captivated by developments, and *is* encouraged to read on his own. Aerospace and aviation are very definitely interesting and meaningful to the air-age pupil. Learning through actual experience *is* a principle relied upon by successful teachers throughout the educational structure. Visits to airports, to control towers, to maintenance facilities and operations offices are just as logical adjuncts to learning as visits to a dairy, a manufacturing firm, or a firehouse. Abstractions in mathematics and science can be made meaningful to the student when their practical application is demonstrated for him in such interesting fields of activity as aviation. Transportation – the movement of people and things from one location to another – can be easily used to teach time-speed-distance relationships, logistic problem solutions, and economics, all based heavily on air transportation today.

Boredom, lack of interest in school subjects, and listlessness are all signs of the potential school dropout. It is rare that a student exhibits these marks, however, in an aerospace or aviation education class. Almost universally students in such classes are stimulated to further learning, to independent reading and research, and to a comprehension and retention of what is learned about aviation. What is learned in the elementary school serves as a stepping stone to further knowledge in the high school and college. It appears rather conclusively that the elementary school and the junior high school are the optimum level at which such topics as aviation and aerospace should be introduced into the curriculum.

Exemplary Programs

In view of the fact that aviation and aerospace programs at the Elementary and Junior High School level are primarily integrated with other subject or course areas, such as mathematics or science, it is difficult to single out individual programs as models for others. Some such programs, however, are well worth mentioning.

The Newport-Mesa Unified School District of Newport Beach, California conducted what might well be considered one of the more unique programs

20. *Aviation Education and the Space Age*, op. cit.

of learning in space science during the period from September 1, 1966 through March 30, 1971. The project involved students from kindergarten through grade 12 throughout Orange County and was an Elementary and Secondary Education Act (ESEA) Title 3 Project, funded by the Federal Government to the extent of $221,765. The main objectives of this program were:

1. To improve and enrich science and mathematics offerings for students K through 12 through the implementation of specialized programs to meet new curricular needs of students.
2. To bring science curricular offerings "up to the minute" by making it possible for space scientists and teachers to work together in the development of materials to meet curricular needs.
3. To carry out planned changes in science and mathematics curricula by utilizing the mobile science laboratory as a tool.
4. To evaluate a computer mathematics phase of the project by analyzing costs per pupil and student achievement.

Thirty-four faculty members in the school district planned and wrote programs under the direction of the district administrator. Specialized curriculum units developed by teachers under the project, with the assistance of scientists and engineers from local space industries, were implemented in the classroom. These new units extended from space science in the elementary school first grade through seminar and institute activities and course work on the high school level. The second year of science center activities saw such developments as:

1. A high school summer science institute presented by teachers and scientists.
2. A space-science seminar for sixth graders, presented by teachers and scientists from the community.
3. An in-service training program for science and mathematics teachers.
4. Implementation of a program utilizing a mobile science laboratory.
5. Development of computer mathematics courses on the junior high school level.

Space industry scientists from throughout Orange County formed and served as an advisory board to identify new curricular needs, plan for student and teacher seminars, and develop the mobile science laboratory. Members of the advisory board and their space industry colleagues worked with teachers in presenting lessons directly to students in seminars, as well as in elementary, junior high school, and senior high school classes. Maximum use was made of the human resources available in the district in sharing the tasks of educational responsibility. Also serving on the board were members of the faculty of the University of California at Irvine, who participated in the development of classroom units and student seminars.

Some of the more significant results of this program were the preparation of new classroom units on space science, which were then introduced into the science and matehmatics curricula on selected grade levels in the elementary school, within traditional subjects at the high school level, in completely new subjects at the high school level, and in units within the social science field. In many cases, the units contained subject matter and data presented for the first time to students. Most of the data included represents science and mathematics information prepared by the teachers and scientists for the purpose of stimulating learning within the students and to assist them in preparing for a rapidly changing environment.

In an evaluation of the effectiveness of this program, the General Learning Corporation, with later substantiation by an evaluation consultant from the University of Southern Nevada, assisted teachers and the project director in the development of criteria to analyze how new data and new activities affected student learning. Detailed records were kept in determining how well the objectives of student seminars, enrichment classes, and mobile laboratory programs were met. Results of the evaluation supported the conclusion that behavioral objectives were met, science and mathematics offerings were successfully updated, and effective course enrichment was accomplished.

In San Bernardino's City Unified School District, the *Serrano Junior High School* has an aviation and aerospace program which is the product of the

teacher's experiences in aviation and aerospace education workshops at the national level in various communities. Such workshops focus attention on the need to include subject matter on the aerospace industry in the secondary curriculum. The Serrano program began in 1967 at Fremont Junior High School – also located within the San Bernardino City Unified School District. There, the instructor organized a "space club" at the school. The chief current interest is space age technology, and one of the more interesting activities has been model rocketry. During the summer sessions of 1968 and 1969 at Fremont, one of the co-sponsors of the club taught a course in space science centered around space activities of the last decade and using model rocketry as a vehicle. The current course being offered is offered on an experimental basis and is entitled "aerospace technology." This course began with a one-semester study of aviation including the design and construction of model gliders. The second semester is devoted to space studies with a concentration on study of the space industry. Activity for the students includes a unique instructional program, employing student "experts" in every field of endeavor related to design, graphic representation, production, testing and flying of a space vehicle – in this case, of course, the space vehicle is a model rocket.

22

Space prevents citing all of the many excellent programs in our Junior High Schools and Elementary schools, but one more considered to have been particularly effective was conducted in the *Richmond School District.* The 3-year program there was funded by the Rosenberg Foundation and began at Roosevelt Junior High School, a black segregated institution. It was an innovative educational experiment which used a light, single-engine airplane to generate basic instructional and behavioral changes in an inner-city junior high school class. The flight project involved 25 disadvantaged area, 13-year-old boys and their parents, four regular staff teachers, two pilot instructors, a college student tutor, and a cooperative junior high school staff willing to try anything – plus a few visions. The project was the brain child of Robert Mullen, a World War II flier who is now the coordinator of special projects and counseling for the Richmond School District.

The Rosenberg foundation came into being in 1936 as a result of the philanthropic and public spirit of Max L. Rosenberg. Mr. Rosenberg loved California, the state in which he was born, and had a special interest in young people. Although he used the most sweeping terms in bequeathing his fortune to philanthropy, the trustees (of the foundation) have chosen to limit the Foundation's grants to California and to assisting programs for children and youth in their formative stages when it is hardest to get financing, and when their value remains as yet uncertain.[21]

Mr. Mullen believes (as do many others) that many Negro youths from poor families do badly in academic work primarily because of their low self-images, not because of lack of sheer ability, and that many of the compensatory education programs now under way simply reinforce their view of themselves as failures. He reasoned that one way to counteract this feeling was to engage the boys in an activity that is of obviously high status – and flying is certainly that to most teenage boys.[22]

The 25 boys chosen to participate in the project (there is a matched control group in another junior high school) were 80 percent Negro, 13 years old, all residents in the area for a minimum of five years, had low achievement as measured by standardized tests and grades in academic subjects, and most showed one or more (usually more) significant behavior problems. Their measured IQs ranged from 78 to 104. More than two-thirds of the boys had been suspended from school at least once. Their responses to questions about attitudes revealed that most of them had little sense of control over their own futures, did not feel they had "much to be proud of," and had rather low expectations of life itself. When their parents were asked if they had thought about what occupation they might like their sons to follow when they were grown, 74 percent responded that they had not; the other 26 percent all aspired to professions requiring levels of academic preparation and achievement far beyond what their boys were reaching or were likely ever to reach.[23]

Once accepted, the boys were plunged into an entirely different kind of total program than they had had before. Back at Roosevelt Junior High, where they still spent most of their time, they were in a special aerospace curriculum conducted by four teachers, one each in mathematics, English, social studies, and industrial arts. The idea was that the course work would draw, insofar as possible, upon materials relating to flight and allied subjects, but each teacher was free to use whatever he or she wanted and was able to find. As a matter of fact, their methods varied considerably. And the students themselves had an effect on curriculum. In social studies, for example, pressures toward orthodoxy came from the boys, who knew that their friends in other classes were learning the Constitution and that a test on government is required for graduation. The boys also sought and got some revisions in their shop courses.[24]

Just how well did this program work? The Rosenberg Report for 1968 stated: "By the end of the first year of the project, differences were clearly apparent in most of the boys. Absenteeism from school, for example, is a chronic problem at

21. President's message, Rosenberg Foundation Annual Report, 1968, San Francisco.
22. Rosenberg Foundation Annual Report, 1968, Page 19.
23. Ibid.
24. Ibid.

Roosevelt, with the normal absence rate running at from 12 to 14 percent. The flight students had an absence rate of 2 percent, and their teachers commented that the boys would often come to school even when sick. Not one of the aerospace boys was suspended from school during the project, while 20 percent of the control group were suspended for periods up to 14 days."[25]

In academic subjects, too, there was vastly improved achievement, with all of the flight group students showing considerable improvement in mathematics and in reading ability. What was perhaps even more important, however, was the fact that the students' aspirations and self-esteem all showed marked changes for the better. The boys were less fatalistic, were more optimistic about the future, showed a greater incentive to achieve, and were much more realistic about their future and their ambitions.

The Roosevelt Flight Project received two Rosenberg Foundation grants totaling $25,855. At the end of the first year, it was considered to have achieved a considerable measure of success, so much so that the school staff recommended that all of the boys be continued for a second year. Subsequently, based on further successes, the project ran for a third year in 1970. What is significant about the successes of the Richmond School District program is that no special effort was made to supply optimum teachers for the project, and only one of the instructors had any previous experience with airplanes. The second year of the program witnessed important program changes. By that time, the pupils had advanced to senior high school. An extra teacher was added to provide released time for program development and consultation. Teachers met frequently to construct a ninth-grade curriculum based on an inter-disciplinary approach. Each unit in Math, Science, English, History and Shop had aviation as its common focal point. Gains occurred in (1) attendance; (2) holding power; (3) reading and mathematics ability; (4) tracking; and (5) behavior. None of the project youths have dropped out of school. In the Aerospace History and Social Science courses given at the senior high school level, 44 percent of the Flight Project youths received honor grades; 31 percent received C grades; 25 percent earned D grades, and none received an F grade. At the inception of the *program none of* the project pupils was a fast reader, 13 were classed as average readers, nine were considered slow, and three were definitely retarded. At the end of the second year of the project, five of the original project students are categorized as fast readers, 17 are average readers, and three are classed as slow readers.

In 1970, the National Laboratory for the Advancement of Education awarded its Bronze Medal of Achievement to the Richmond Unified School District. The Flight Project was selected as one of the most innovative educational programs in the nation.[26]

25. Ibid.

Recommendations

1. Currently available written materials should be reproduced and made available to all school districts. This reproduction should be on a selective basis, choosing the best available materials.
2. It is essential that the sections in the Education Code dealing with Aerospace-Aviation Education be fully implemented.
3. On the basis of knowledge about aviation and the uses of aviation to motivate students, potential teachers in teacher training institutions should be afforded an orientation to aviation and aerospace.
4. Teachers currently in service should be afforded Workshops and training sessions, properly organized and financed.
5. A solution must be found to the problem of ensuring school districts against potential liability loss when providing educational flight experiences to pupils.
6. Teachers who are currently licensed pilots should be encouraged to use aviation in their classroom situations.
7. Close cooperation must be maintained between the schools and aerospace industries so that information and concepts taught in the schools are in line with current and projected industry needs.
8. The possibility for airline pass privileges for teachers, on an orientation basis should be researched, not excluding the non-scheduled air carriers.
9. Priority should be given to the development of a low-cost, manipulative flight simulator for use by those schools where there has been encountered a

26. Second Report, *Learning Through Aviation*, Richmond, 1970.

lack of parental acceptance of flight experience for pupils. Simulated or real flight experience can not only become a laboratory for classroom learning – just as a physics laboratory is for a physics class – but can also tie the pupil in emotionally with the real world around him. At the lower levels, the device can be simple, even being built by the pupils themselves. At the middle grade and junior high levels, a simulator such as the GAT-1 (General Aviation Trainer) would be useful.

10. School districts should be encouraged to work with interested aviation groups in their community. Local fixed-base operators, flight schools, the Federal Aviation Administration, and such groups as the Aircraft Owners and Pilots' Association (AOPA), the Airline Pilots' Association (ALPA), the Air Transport Association (ATA), the Flying Physicians, the Flying Farmers, the Ninety-Nines (a womens group), the Civil Air Patrol are al available. Schools should be encouraged to brin into the classroom local speakers who are knowl edgeable about aviation and aerospace, regardles of the age group of the pupils.
11. Schools should be made aware of library materiol and publications now available from the Unitec States Air Force, the United States Navy, Th National Aeronautics and Space Administratior (NASA), The Aviation Distributors and Manufac turers Association (ADMA), The General Aviatior Manufacturers Association (GAMA), and th manufacturers of aircraft, such as Beech Aircraf Corporation, Piper, Cessna, and others.
12. Further research (and possibly funding) should b made available to explore the possible advantage of incorporating aviation programs in schoo curricula to captivate and retain potential schoo dropouts.

High Schools and Community Colleges

At the high school and junior college (community college) level in the student's educational career, he should be looking to the "bread-and-butter" aspects of his future. It would seem to be a particularly appropriate time to explore the vocational aspects of aerospace-aviation education. From the highly technical skills to the "support service" vocations, long-term and short-term training classes can and should be matched to the need. On the other hand, however, some industry representatives and some committee members expressed a greater need for a well-rounded development in educational studies and attitudes, and the sense that "industry would take care of the specifics in training in its own fields." On sober reflection, it would appear that this is a very realistic approach because of the constant changing aspects of technical need and opportunities for employment. Committee members expressed some reservations and second thoughts about the thrust of education at the high school level in particular. Others were enthusiastic in their endorsement of aerospace-aviation courses in the schools.

> The airplane is going to school, and not in the traditional role with flight schools or vocational schools. The airplane is going to high school to teach physics, geometry, English, social studies, math, and just about every subject taught in the classroom. There are an increasing number of indications that a "fly to learn" program can go a long way toward solving many educational problems. These demonstrations indicate that the collective experience of the aviation community represents an enormously valuable teaching resource.
>
> Students fail, both in name and in fact, because school is frightening or boring, or both. The innate curiosity that stimulates a child to learn so much before he reaches school is soon repressed. What the student often finds in the classroom are courses oriented toward the "right answer," and instructional methods that are uncreative, unchallenging, irrelevant and – more often than not – uninformative . . .
>
> . . . In 1971, an estimated 1,000,000 students will have dropped out of school and into a labor market already heavily biased against its younger members. That means more than one out of every five students drops out before graduating. Even those students who do persevere and even receive high grades are not truly educated, according to many critics.[27]

27. Tucker Taylor, *The Airplane as a Teaching Tool*, FLYING, December, 1971.

> Yet paying for the present system poses its own problems. Educating our young people in 1969-1970 cost local and state governments, the Federal Government and private sources $70,600,000,000. If you're an average taxpayer, 70 Percent of your local taxes go to operate the school system . . .
>
> . . . Is the system capable of overcoming its bureaucratic inertia and outmoded approach, and of evolving new methods to meet the rising demands of the present and foreseeable future? . . .
>
> . . . The concept of aviation as educator lends an element of social value to aviation at a time when it is sorely needed . . .
>
> . . . The promises of our political and economic system can only be achieved with an educated populace. Many present curricula and traditional teaching methods are resulting in the systematic stultification of what is promising for America. Since it's impossible to predict what facts and procedures are going to be required by society in the future, the goal of an educational system must be to instill a desire for self-education and discovery . . . the airplane can be perfectly suited to the task.[28]

The most widely promoted and best documented approach to aerospace-aviation education at the high school and community college level is an elective aviation science course, strongly oriented to pilot ground and flight training. Much effort has gone into development of guides for this type of course. The underlying philosophy of this approach is that it provides the student with general orientation to aviation, and becomes, in effect, the foundation for careers in aviation.

Under the aegis of the California Department of Education, an "Aeronautical Science Course of Study" was developed and published in 1969. This course contained 11 separate units. The Task Force recognizes the fact that such a prescribed course may not be appropriate for some schools, but it does give a good overview of aerospace, aeroscience, or aviation – whatever you choose to call it. The course outline was considered by the Federal Aviation Administration and was deemed to be of sufficient national interest to warrant having it made available through the United States Government Printing Office.

The 11 units in the developed course were:

1. Basic Aeronautics.
2. Meteorology.
3. Navigation.
4. Federal Aviation Regulations.
5. The Speed of Sound.
6. Physiology of Flight.

28. Ibid.

7. Man in Space.
8. History of Aviation.
9. Economic Factors of Aviation and Space.
10. Flight Indoctrination.
11. Flight Training.

At least 75 California high schools offer such elective courses. In 1970, Sanderson Times Mirror conducted a survey and compiled the results into a document entitled "High School Aviation Aerospace Education Status Report, 1971." The survey was conducted in cooperation with the Federal Aviation Administration, interested members of the Aircraft Distributors and Manufacturers Association (ADMA), and the General Aviation Manufacturers Association (GAMA).

The survey revealed a profile of the typical high school aerospace-aviation education course. Typically, the school had a total enrollment of less than 1500 students and it was a public, tax-supported general education high school. The course was called either "Aeronautics," "Aviation," "Aerospace Education," or "Aviation Science," and was offered as a full-year (two-semester) program for which students received one credit unit applicable toward graduation. Freshmen and Sophomores were not eligible to take the course, and some degree of selectivity was exercised in screening the juniors and seniors who did enroll. Typically only one aviation-aerospace class per day was taught, and the course was classified as a "science." Students averaged 1.97 hours of flight orientation during the course, but did not receive dual instruction. The student orientation flights were on an optional basis and were financed by the students themselves and/or their parents. The typical curriculum compared well with that listed at the top of this page and consisted of

Aviation History	Radio Navigation
Aerodynamics	Primary Navigation
Meteorology	Communications
Aircraft Systems	Engines/Powerplants
Flight Computer	Instruments
Federal Aviation Regulations	Aircraft Weight and Balance

Most of the programs were considered by the instructor to be a "ground school" or "general aviation course," and most had been in operation for only one, two, or three years. Many, if not most, schools used a commercially produced audio-visual training course as supplemental instructional material, and most preferred that their course not be included under industrial arts, social studies, or similar classifications.

Almost universally, the survey found that teachers felt that the three most important problems facing schools beginning such aviation-aerospace programs (in order of importance) were:

1. Money
2. Lack of Interest on the Part of Administrators
3. Finding a Qualified Teacher

Some superintendents have expressed dissatisfaction with the present method of credentialing of teachers for their aerospace-aviation courses. There seemed to be little in the way of standardization of qualifications for such credentials.

The Bureau of Teacher Education and Certification, within the California State Department of Education has adapted guidelines from the California Education and Administrative Codes.

The Standard Designated Subjects Teaching Credential — Aviation Flight Instruction and/or Aviation Ground Instruction

A standard designated subjects teaching credential in aviation flight instruction and/or in aviation ground instruction shall be granted to an applicant who submits a complete application and has completed these specific requirements.

Aviation Flight Instruction

A valid flight instructor's certificate (*Not* a limited flight instructor's certificate) issued by the Federal Aviation Agency (sic) Administration, with the appropriate rating for each subject to be listed on the credential.[29]

Aviation Ground Instruction

A valid ground instructor's certificate issued by the Federal Aviation Administration, with the appropriate rating for each subject to be listed on the credential.

Authorization for Service

This credential authorizes the holder to serve as aviation flight instructor, and/or as aviation ground instructor at all grade levels in those subjects verified as appropriate by rating of the Federal Aviation Administration.[30]

The survey presented a profile of the teacher in typical high schools.

High school aviation-aerospace teachers are a comparatively well educated group within the academic community with 54 percent holding a Master's Degree; 42 percent of the teachers have earned their Bachelor's Degree only; and 0.3

29. Note, the Federal Aviation Agency became the Federal Aviation Administration.
30. Credential Requirements, Revised 11-67. California Department of Education.

percent hold Doctorates. One percent do not possess a college degree. Those who do not hold a college degree are usually teaching under emergency certification based on aeronautical-technical experience and frequently are not regular, full-time teachers. These instructors are employed to teach one or two classes in cases where a qualified, certificated teacher cannot be found. A total of 5.5 percent of the aviation-aerospace teachers are not teaching full time.[31]

It also found considerable difference in the background of the aerospace education teacher. During the survey, it was found that the undergraduate major field of specialization of the teachers was:

Natural Science	30%
Industrial Arts	18%
Mathematics	12%
Social Science	10%
Physical Education	6%
Education	5%
Business	5%
Agriculture	4%
Music	2%
Others	8%

The Sanderson report indicated that approximately 98 percent of the high school aviation-aerospace courses included one or more field trips to such installations as the following (percentage figures as shown):

FAA Airport Traffic Control Towers	70%
FAA Air Route Traffic Control Centers	37%
FAA Radar Approach/Departure Facility	30%
FAA Flight Service Station	55%
United States Weather Bureau*	68%
Fixed Base Operation	65%
Aircraft Maintenance Shop	50%
Commercial Airline Facility	32%
Military Installation	31%
Aircraft Factory	19%
Museums	7%
Other	15%
No Field Trips	2%

NOTE: *Now known as the National Weather Service.

It should be noted that these figures were the result of a nationwide survey. Availability of facilities, obviously, plays a large part in choosing sites for visits.

In the average course content at the high school level, it was found that 76 percent of the schools used pilot ground school material; 9 percent used historical material; 7.5 percent utilized socioeconomic material; 5.8 percent used rocket-space material; and 2 percent used other materials.[32]

Seventy-three percent of the reporting schools contacted during the survey used commercially produced audio-visual training courses as instructional material. Of that number, 43 percent described the material as supplemental, while the other 30 percent considered it basic. Use percentages for such materials was found to be as follows:

Sanderson	46%
Jeppesen Times Mirror	10%
AV	8%
Aero Products Research	2%
Homemade	12%
Others*	19%

NOTE: *Others included Civil Air Patrol, Federal Aviation Administration, United States Air Force, State, Etc.

The schools were also found to use a variety of textbooks in their programs, and most reported concentrating on one basic textbook for use. The following table gives percentage figures on textbook choice:

Sanderson, Aviation Fundamentals	38.5%
FAA, Private Pilot Handbook of Aeronautical Knowledge	22.0%
Civil Air Patrol, Aerospace Education	6.5%
Jeppesen, Basic Aeronautics	5.9%
Van Deventer, An Introduction to General Aeronautics	5.3%
Mercer, Applied Aviation Science	2.0%
University of Illinois, Fundamentals of Aviation and Space Technology	3.9%
Kershner, Flight Manuals	1.7%
Misenhimer, Aeroscience	1.7%
Pan American Navigation Service, Private Pilot	2.5%
Tower, Basic Aeronautics	1.4%
Zweng	0.9%
Other	5.2%
None	2.5%[33]

It was interesting to note the number of schools using FAA written examinations either as a part of their course, or in conjunction with it. The Sanderson report indicated that the FAA written examination was a course requirement in 14 percent of the schools reporting; it was an option in 56 percent of the schools, while only 30 percent made no use of the FAA examinations.

Amplifying earlier remarks, educators reflected their opinions as to the major problems confronting schools operating aviation-aerospace education programs, in the following order:

1. Money
2. Lack of Interest on the Part of Administrators
3. Finding a Qualified Teacher
4. Liability for Flying Activities
5. Lack of Instructional Materials
6. Lack of Support from Local Airport Operators

31. Sanderson High School Aviation Aerospace Education Report, 1971.
32. Ibid.
33. Ibid.

7. Classroom Space
8. Absence of State-level Concurrence or Approval
9. Lack of Student Interest[34]

In a 1969 survey of some 79 California high schools, only 40 of the schools responded. Those 40 reported a total of 2689 students involved in their aerospace-aviation education courses. It is estimated that the other 39 schools had as many students in their courses, giving a total of something more than 5000 aerospace students. Collection of information through surveys is somewhat of a chancy task. Many schools do not have the time to devote to responses to questionnaires. This admittedly small sampling, however, indicates a considerable interest in aerospace-aviation education in California's high schools.

The Sanderson survey, conducted in 1970, found 91 California high schools conducting such aviation-aerospace education courses. Those in parenthesis in the following listing were involved with Air Force Junior ROTC programs:

Encinal High School, Alameda
(Anderson Union High School), Anderson
Antioch Senior High School, Antioch
(Arcadia High School), Arcadia
Menlo-Atherton High School, Atherton
Standard Jr. High School, Bakersfield
Bishop High School, Bishop
Anderson Valley High School, Boonville
Capistrano High School
Chester Jr.-Sr. High School
Plesant Valley Sr. High School, Chico
San Juan High School, Citrus Heights
(Clovis High School), Clovis
(Compton Union High School), Compton
(Manuel Dominguez High School), Compton
Corona Sr. High School, Corona
Costa Mesa High School, Costa Mesa
Del Norte County High School, Crescent City
Culver City High School, Culver City
Delano Joint Union High School, Delano
Dixon High School, Dixon
Downey Sr. High School, Downey
Ravenwood High School, East Palo Alto
Greenfield Jr. High School, El Cajon
Central Union High School, El Centro
Elk Grove Sr. High School, Elk Grove
Orange Glen High School, Escondido
San Pasqual Academy, Escondido
Exeter Union High School, Exeter
(Fairfield High School), Fairfield
Fontana High School, Fontana
Central Union High School, Fresno
Fresno High School, Fresno
Roosevelt High School, Fresno
Bolsa Grande High School, Garden Grove
Hoover High School, Glendale
Greenville Jr.-Sr. High School, Greenville
Kelseyville High School, Kelseyville
Kingsburg Union High School, Kingsburg
Bonita High School, La Verne
Lakewood High School, Lakewood
Clear Lake High School, Lakeport
Woodrow Wilson High School, Long Beach
Manual Arts High School, Los Angeles
Los Gatos High School, Los Gatos
Lower Lake High School, Lower Lake
Lower Lake Jr. High School, Lower Lake
(Marysville High School), Marysville
Mills High School, Millbrae
Grace Davis High School, Modesto
Seaside High School, Monterey
Cuyama Valley High School, New Cuyama
(Novato High School), Novato
Petaluma Sr. High School, Petaluma
Pinole High School, Pinole
(El Dorado High School), Placentia
(Valencia High School), Placentia
Pleasant Hill High School
Quincy Jr.-Sr. High School, Quincy
Nova High School, Redding
Redlands High School, Redlands
Aviation High School, Redondo Beach
Redondo Union High School, Redondo Beach
Sequoia Union High School, Redwood City
Eisenhower High School, Rialto
Garvey Intermediate School, Rosemead
Oakmont High School, Roseville
Luther Burbank High School, Sacramento
Alisal High School, Salinas
Salinas High School, Salinas
Crestmoore High School, San Bruno
San Clemente High School, San Clemente
Crawford High School, San Diego
San Gabriel Academy, San Gabriel
Andrew Hill High School, San Jose
Marina High School, San Leandro
Aragon High School, San Mateo
Santa Rosa High School, Santa Rosa
Selma High School, Selma
Ponderosa High School, Shingle Springs
(Stagg Sr. High School), Stockton
Lincoln Sr. Elementary School, Stockton
(Moreno Valley High School), Sunnymead
Jacobsen Jr. High School, Tehachapi
South High School, Torrance
Deuel Vocational Institute, Tracy
Tulare Union High School, Tulare
Vista High School, Vista
Woodlake Union High School
Woodland High School, Woodland
Yuba City High School, Yuba City

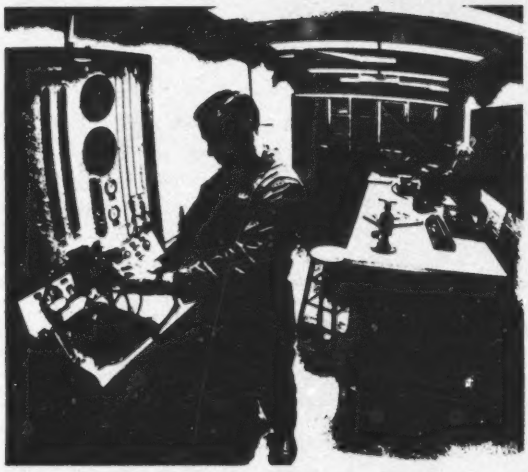
34. Ibid.

This list, while comprehensive, is by no means exhaustive. Many other California high schools are known to have aviation-aerospace courses in their curriculum. The Task Force experienced some of the same difficulties in determining which schools had aviation-aerospace courses. Every school district was queried, and many had no knowledge of the aerospace offerings in their district.

The reader will note in the foregoing listing of high schools that there were 12 reporting Air Force Junior ROTC affiliation. Such courses are essentially aviation science courses. Schools have noted beneficial side effects of the Junior ROTC program as including the instilling of pride and patriotism in the student, improvement in grooming and dress, and a respect for the nation and its flag. Other benefits include partial faculty support, and the availability of instructional materials (including surplus equipment) which otherwise would have to be purchased by the school or the school district.

A word of caution is appropriate at this point in the report for those schools contemplating flight instruction for their students. Such programs are fraught with problems, not the least of which is cost. As one evaluator put it in referring to a recommendation for capital outlay for flight training, such an outlay simply isn't going to happen in most cases. He suggested that one simply does not lay out $10,000 for a small training plane, put gas in it, and be in the flight training business. If it did happen, the budget would multiply at every turn, and be unsupportable. A more viable alternative is to affiliate with a local fixed-base operator or flight school and make the flight training an optional part of the course, with the cost to be borne by the student or his parents. For many years, Redondo Union High School, made its flight training program available through affiliation with the Bates Foundation. Benefactors have made school ownership of aircraft possible in still other cases. The cost of liability insurance has proven to be an almost insurmountable obstacle to many schools, forcing them to concentrate their efforts on other than the flight phase.

In this phase of the report, we have concentrated on the high school aspects of aerospace-aviation education. Some of the same problems faced by the high schools are also encountered at the community college level. For some years, Pacific Aeromotive Corporation granted a year's use of a Cessna 150 aircraft to one high school and one community college. The faculty at Mount San Antonio College, Walnut, California, reported that their acceptance of the aircraft was delayed for three months in a search for funding to cover hangaring of the aircraft and liability insurance. The Richmond School District program cited in the preceding section was only



possible through the philanthropic assistance of the Rosenberg Foundation.

In 1969, the California Department of Aeronautics sought the aid and assistance of the State Department of Insurance in finding an underwriter who would make available liability insurance programs so that schools could cope with insurance problems. The finding was that not one insurer would enter into any blanket program for school aviation programs. They would, however, offer programs individually based and presumably taking into account equipment, qualifications of personnel, facilities, and other hazards. Sections in the Education Code which deal with insurance for schools are largely ineffective, simply because insurers will not accept the risks inherent in blanket policies.

At this time, we feel that it is appropriate to cite the Educational Code sections which apply to aerospace-aviation education.

Aviation Education in Junior Colleges (Education Code)

Courses in Aviation Education in Junior Colleges

25519. The governing boards of districts maintaining community colleges are urged to design courses including air transportation, vocational education, career opportunities in civil and military aviation, technical training, flight experience, and ground instruction in localities where the needs of the youth in these communities warrant such courses in these schools.

35. Extracts from the Education Code, State of California.

Conduct of Classes at Airports (Education Code)

5030.1 The governing board of a unified school district coterminous with the boundaries of a city and county, may conduct classes at the airport and at the county jail which are owned and operated by the city and county, outside of the boundaries of the school district.

Agreement with United States for Establishing Aeronautics Courses in Public Schools (Education Code)

256. The Superintendent of Public Instruction may enter into an agreement with the government of the United States or any agency thereof relative to the establishment of courses of study in aeronautics in the community colleges and technical schools of the public school system except the California State Colleges.

Article 5.8 Aviation Education

ASSISTANCE BY DEPARTMENT OF EDUCATION IN DEVELOPMENT OF PROGRAM

6001. The Department of Education shall aid and assist local school districts in the development and conduct of a program of aviation education. The Department of Aeronautics may aid and assist in the selection of airports and pilots used by the local school districts in flight indoctrination and instruction.

AIMS AND PURPOSES OF AVIATION EDUCATION

6002. The governing board of each district is encouraged to develop aims and purposes of aviation education designed to include: (a) integration of appropriate aviation concepts throughout the elementary school with units of instruction in science, social studies, and arithmetic; (b) aviation experiences in junior high schools in the areas of social studies, science, and arithmetic; and (c) elective courses in senior high schools and four-year high schools including air transportation, vocational training, economic, social and political implications of aviation, the science of flight, history of aviation, and flight experience where appropriate airports, planes, and pilots are available, and the need for such instruction is indicated. Periodic reports shall be made to the Department of Aeronautics concerning the flight indoctrination and instruction program.

INSURANCE PROGRAM AND SUPERVISION FOR SCHOOLS OFFERING FLIGHT EXPERIENCE

6003. The Department of Aeronautics is authorized to make available to public schools offering actual flight experience as part of the regular curriculum a basic insurance program and to assure that adequate supervision and precautionary measures are taken by the flight school operators contracted (with) to provide services for public school students. The governing board of any school district offering actual flight experience as part of the regular curriculum may participate in the basic insurance program provided by the commission (Department of Aeronautics) and pay from the funds of the district a pro rata share of the cost of the insurance program.

Commentary on the Education Code

We must first recognize that the Superintendent of Public Instruction no longer has any control over the State's community colleges. His supervision now extends solely to the elementary and secondary schools of the State. The affairs of the community colleges are now directed by the Chancellor of the Community Colleges.

We must also report that despite clearly written sections in the Education Code, in effect, a mandate, the State Department of Education has virtually withdrawn all support for such programs.

At this instant I have before me a letter that will be going to all of the 80 members of our statewide Aerospace Education Advisory Committee, and the (almost 100) school districts that are offering very productive aerospace education programs. This communciation regretfully must report that the State Department of Finance has removed all monies and consultant services (presently offered by the Bureau of Elementary and Secondary Education) in the field of aviation education from the proposed Governor's Budget for 1971-72. This complete elimination of service has occurred in spite of the very clear mandate in Education Code Section 6001 that states "The Department of Education shall aid and assist the local school districts in the development and conduct of a program of aviation education." In essence, the Governor's Office and the Depart-

ment of Finance have decreed that we may no longer render this kind of service . . . The Department of Education hasn't yet indicated its reaction to the recommendation of the Department of Finance that we discontinue all aviation education service . . .[36]

It is manifest, then, that the governing sections of the Education Code are being virtually ignored, in fact, if not in principle. Greater priority consideration is being afforded other aspects of the educational system, to the detriment of the aerospace-aviation education goals.

Even without the aid and assistance of the Department of Education, some of our high schools have developed exemplary programs in aerospace-aviation education.

Anderson Valley High School, in Boonville, California applied for and was granted a PACE Grant to establish a vocational humanities program in a small rural high school. After consultants and experts had been hired, it was decided that one of the programs the school must become involved in, as far as education for the future is concerned, was that of aviation. In cooperation with the Mendocino County Schools office, Anderson Valley High School was able to acquire a donated Cessna 150 airplane from G&H Aircraft, of El Monte, California. The aircraft was made available on a year-to-year basis. Through the aid of W. Earl Sams, Bureau of Elementary and Secondary Education consultant in the Department of Education, an instructor was found who also had a general secondary education credential.

Insurance was solved through a private insurance broker with offices in El Monte and Sacramento. It was found necessary to fund the program in order to reduce the cost of flying and a maintenance program in the school. This was made possible through a Vocational Education Act of 1968 proposal, which was approved by the State Department (of Education). In its first year, Anderson Valley High School students flew a total of 690 hours. Fourteen students soloed; 19 had more than 40 hours of dual training; 25 students were in their second year of aircraft engine work; and 32 students completed basic ground school. In the second year, 27 students were in the ground school phase; 32 were taking flight instruction; 40 were in the airframe/powerplant program. The school was successful in its bid to acquire use of a new 1969 Cessna 150, donated by Pacific Aero-motive Corporation for the year.

Lower Lake High School, in Lake County, inaugurated its first flight program in the fall of 1969. The school leased its aircraft from Western Aero Leasing, of Sacramento. They paid for their own insurance, and the students flew during the school day. Vocational Education Act (VEA) funds were obtained, and the school has a qualified instructor on its staff. Instead of concentrating on the A&P phase of training, this school aims their supporting efforts at avionics. There are certain basic differences between the programs at Anderson Valley High School and Lower Lake High School. Lower Lake airport is more than a mile from the school campus, while at Anderson Valley, the airport is in its own backyard. Both schools have non-controlled airports, and both planned to place into operation a Unicom, to be manned by students during school hours – affording the opportunity for training in communications.

Del Norte County High School, in Crescent City, offers an aviation course, including actual flight instruction. The program was one of the first in the nation to provide the full combination of aviation education ground school, use of a flight simulator, and actual flight familiarization and training in aircraft. In 1946, the local airport manager (now Congressman Don Clausen) began teaching Principal C. A. Thunen to fly, immediately demonstrating how students could be dramatically motivated to advance their learning process through full exposure to aviation education and flight training.

Thunen, Clausen, and a very enlightened Board of Trustees brought the matter of acquiring an aircraft to the attention of a citizens' committee. A former Del Norte student, Mr. Don McMillan, greatly intrigued by the idea, donated his Piper Super Cub to the school for student use. Boys, girls, and faculty members were encouraged to fly. Adult aviation education programs were coordinated with the school program. A dedicated faculty member, Mr. Ardean Sveum, acquired his flight instructor rating, and with the cooperation and encouragement of Principal Mike Whalen and the aviation-oriented Board of Trustees, expanded the program to a point of acceptance and accreditation by the State of California Department of Education. Flying was optional, and carried no extra high school credit, but the ground school class did earn credits. For the flying, the students paid a nominal fee of approximately $5.00 per hour – an amount inadequate to pay the entire cost, but adequate to keep up with fuel and oil bills, with a small amount set aside for maintenance and upkeep of the aircraft. Recognizing the value of the program, the School Board became enthused about the entire project. After using the donated Super Cub for several years, the School Board bought a Piper Tri-Pacer to be used in the flight program. This aircraft permits three students, plus the instructor, to fly. The aircraft has been replaced every other year or so, insuring the availability of a good, new, and modern airplane, at a depreciation cost of somewhere around $2,000 – an amount which is not considered

36. From a letter from the Bureau of Elementary and Secondary Education, State Department of Education, April 13, 1971.

excessive when compared to the equipment cost of a laboratory, shop, typing, or athletic program. The student still continues to pay the costs of gas and oil, and minor maintenance costs, paying on a sliding basis. The student is given two hours flight indoctrination at no cost. For the next 10 hours, he or she pays $2.00 per hour. For the next 50 hours, the charge is $4.00 per hour. Anything beyond that time is costed out at $6.00 per hour. The School Board carries liability insurance, while the flying fees enable payment for hull insurance coverage.

The school also maintains a surplus Link Trainer (flight simulator) for use in the ground school phase. The trainer is also made available to adults taking night classes at the school. Lacking a suitable text at the outset of the program, flying instructors composed a textbook guide, which was reproduced by Del Norte County High School. Graduates of the school's aviation program have found success in the various segments of aviation. One became a jet flying instructor in the United States Air Force. Many became commercial pilots with multi-engine and instrument ratings; several are A&P mechanics; and quite a number are private pilots. The program has been co-educational, and several of the girl students have soloed.

Currently, Mr. Keith Wise has over 60 students in various stages of flying. His innovative and creative talents are an example of the type of aviation educator required for success. Experience has clearly shown that the ability and dedication of the instructor will gain the respect of students and increase the support for the program by parents and other citizens of the community. This is vitally necessary in order to provide community backing to the Board of Trustees and the School Administration for aerospace-aviation education. Each year, special recognition is given to the selected outstanding aviation student by presenting the winner with a permanent trophy – "The Don Clausen Aviation Award." In addition, the winner's name is inscribed on a permanent plaque displayed in the school's trophy case.

Aragon High School, San Mateo Union High School District, offers an aerospace program to start career training in an industry that "not only is growing rapidly, but also offers innumerable benefits to its employees – good pay, health insurance plans, and inexpensive travel opportunities throughout the world . . ."[37]

The program is a two-year, junior and senior elective program for both boys and girls, using aviation and space as the focus of study. It involves:

1. an interdisciplinary approach, with applications in science, aero lab, pre-flight, English, and mathematics
2. A vocational emphasis, particularly in aero lab and preflight
3. the preparation in aerospace and science of both the student who is planning to continue his education beyond high school, and those who are making high school their terminal study objective

Resources available in the San Francisco Bay Area enable students to take field trips to the following:

- United Air Lines Maintenance Base and Service Center
- Pan American World Airways Service Center and Training Center
- American Air Lines Freight Handling Facility
- San Francisco International Airport, Terminal Dispatcher Offices, Planning Centers, and FAA Airport Traffic Control Tower
- Palo Alto and San Carlos General Aviation Airports
- United States Geological Survey Center
- FAA Air Route Traffic Control Center in Fremont
- Stanford University Linear Accelerator Center
- Facilities of the National Aeronautics and Space Administration (NASA) at the Ames Research Center on Moffett Naval Air Station
- United States Coast Guard Station
- College of San Mateo
- California State University, San Jose

Aragon High School's aero lab offers facilities for studying and working on aircraft structures, hydraulics, instruments, power plants, electrical systems, and electronics systems. The school also owns and operates a Link Trainer, providing simulated flight conditions.

As an option, the student interested in flying, may pursue that interest at Palo Alto airport. This part of the training is arranged for by the student, in direct cooperation with Nystrom Aviation, one of the fixed-base operators at the Palo Alto airport.

As the school staff expresses it:

> Through the aerospace program, we try to do the following:
>
> 1. Meet a vocational or avocational interest of students
> 2. Prepare students in technical subjects for college
> 3. Provide a more meaningful and interesting approach to study and education through the interdisciplinary study of aviation and space

There are so many excellent programs in the California high schools that it is difficult to single out the standout among the exemplary programs. Perhaps as close as we can come to finding a standout, however, is the program at *Redondo High School* in

37. From Aragon High School's description of its program.

the South Bay Union High School District at Redondo Beach. The Aero Science program at this school consists of a two-semester laboratory science course, designed to provide the student with an overview of air transportation, history of aviation, aeronautical science, and pre-flight. Also presented are studies and laboratory experiences associated with basic aeronautics, theory of flight, aircraft stability, engines, propellers, instruments, meteorology, navigation, and flight indoctrination. The flight indoctrination portion of the course consists of two hours of flight time in a Cessna 172 aircraft, and is considered to be an integral part of the laboratory instruction. Students are afforded practical demonstrations of navigation, meteorology, communications skills and radio procedures, the uses of radio aids – such as the omnidirectional radio facility –, pilotage, and dead reckoning. This flight experience is given as orientation, and is not aimed at making pilots of the students. Its goal, rather, is to foster and create a better understanding of the importance of aviation to our modern technology and transportation systems.

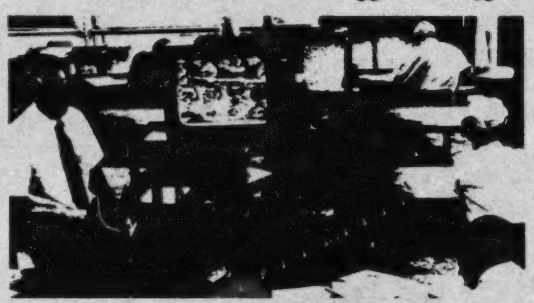
Costs for the flight orientation program are underwritten by the Bates Foundation for Aeronautical Education. Among its laboratory facilities, the school has a Link Trainer, in which the student is able to duplicate aircraft control movements and maneuvers. By the end of the program, each student has a minimum of four 15-minute flights in the simulator, giving him an insight into the mechanics of controlling an aircraft solely by reference to instruments, and focusing his attention on the importance of navigational aids. In addition, each year a number of students take flight instruction at their own expense at the Torrance Airport, working with fixed-base operators and flight schools. The school does not become involved with this phase of extra-curricular activity, but contents itself with thoroughly coordinating the ground school phase of instruction. The school's alumni include many graduates of the aeroscience course who have gone on to employment with North American, McDonnell Douglas, United Airlines, NASA, the United States Air Force, and the United States Navy.

Among the benefits attributed to the aeroscience course are a fulfillment of the laboratory science requirements for non-science majors, and the motivation of average or under-achieving students to improved academic performance and progression to college.

Community Colleges

We turn now to the junior colleges, or as they are now known, the community colleges. In 1968, a survey of the State's community colleges revealed that 33 of them had aviation programs in their curricula. Nineteen were involved in one way or another with flight programs. At several others, the students had aeroclubs, and participated in such flight programs as extracurricular activities. The 1968 survey results are shown below:

Community College	Ground School	Flight Program
Chabot College	Yes	Yes
Chaffey College	Yes	Yes
Coalinga College	Yes	No
College of the Desert	Yes	No
College of the Redwoods	Yes	No
College of San Mateo	Yes	Yes
Cypress Junior College	Yes	No
DeAnza College	Yes	Yes
Diablo Valley College	Yes	Yes
Foothill College	Yes	Yes
Fresno City College	Yes	Yes
Gavilan College	Yes	Yes
Glendale College	Yes	Yes
Golden West College	Yes	No
Laney College (Now Alameda College)	Yes	Yes
Long Beach City College	Yes	Yes
Los Angeles Trade and Technical College	Yes	No
Merced College	Yes	Yes
Modesto Junior College	Yes	No
Mount San Antonio College	Yes	Yes
Orange Coast College	Yes	No
Palo Verde College	Yes	No
Pasadena City College	Yes	No
Reedley College	Yes	Yes
Sacramento City College	Yes	Yes
San Bernardino Valley College	Yes	Yes
San Diego City College and San Diego Evening College	Yes	Yes
San Diego Mesa College	Yes	Yes
San Joaquin Delta College	Yes	No
San Jose City College	Yes	No
Santa Barbara City College	Yes	No
Santa Rosa Junior College	Yes	No
Shasta College	Yes	Yes
	33	19



A later survey of 82 community colleges elicited the indication that 49 had aerospace-aviation programs. It was found that there were 464 courses being offered, with some 8226 students enrolled at the time of the survey. Attention was focused on a recurring and persistent statement of problems at this level, and that was the poor articulation of these programs with those at four-year colleges. For example, it was found that some of the 13 Southern California community colleges having aerospace-aviation education courses were unable to articulate their programs with those of the four-year colleges. Only one four-year college in the State was found to offer such programs, California State University, San Jose.

The survey indicated that California Polytechnical College would accept, but only credit as electives, course credits earned in aerospace-aviation at Mount San Antonio College, and that Cal Poly was not developing a major in aerospace education. San Francisco State and Hayward State Colleges would accept graduates from the community colleges whose specialization had been in aerospace-aviation, but would phase them into an industrial arts program.

Other problems have included the cost of financing insurance and providing maintenance for owned aircraft. Mount San Antonio College received from Pacific Aeromotive Corporation the grant of a year's use of a new Cessna 150 aircraft, but had to forego acceptance for approximately three months while the college sought an "angel" to underwrite the costs of insuring and hangaring the aircraft. The insurance premium alone was $3200, while the hangaring and storage of the aircraft presented additional cost problems.

In this regard, we are indebted to one correspondent from the aviation industry who reported as follows:

> The American Association of Junior Colleges, in its *Aviation Guidelines* – a study, with recommendations for the inauguration of aviation programs in the schools – has stated that at least 90 percent of the programs in the United States are carried out in conjunction with extant fixed-base operators and privately owned flight schools. The obvious reason being that in an overwhelming percentage of the cases, it was the only viable alternative. It was also a *now* alternative; a quality shared only with the aircraft leasing method, which latter possessed too many other drawbacks to be attractive; such as personnel, maintenance, management, and insurance.

The same correspondent added:

> I believe that the only workable proposal would be to urge only that the community colleges reach agreement with established, privately operated flight training schools; such schools to be approved by the Federal[38] Aviation Administration, the Veterans' Administration, the California State Board of Education, and the California Department of Aeronautics.

Some committee members have expressed concern about what might well be considered an emphasis on flight aspects of aerospace-aviation education. The hard truth of the matter is, however, that for every pilot flying today, there are many, many supporting positions. The community colleges are particularly involved with a vast array of technically and vocationally oriented curricula, and one of the most important of these is in the field of aeronautics.

In the list of some 20 Federal Aviation Administration approved airframe and powerplant (mechanic) schools, 13 are provided in public community colleges, and at least three more were in the planning stages at the time the survey was conducted.

Some of the community colleges offer airline stewardess courses of training. One of those colleges, with a fine record of graduate placement with the airlines, is Mount San Antonio College, in Walnut, California.

Students with an overview of the aeronautics industry, and possessing special skills in accounting, typing and other business subjects, can furnish a reservoir of trained personnel to work in insurance, airfreight and passenger reservations. Observers have noted job opportunities for culinary workers, upholsterers, plastic experts, hydraulics and pneumatics specialists, avionic technicians, and many other fields of endeavor.

In the realization that many aero students must work, the College of San Mateo embarked upon a program of cooperative education. Through arrangements partially funded with monies apportioned from the Average Daily Attendance (ADA), students go to college in alternate semesters, and work in aviation during the other alternate semester. Another project provides for students going to school for a half day, and working the other half day. Under a Ford Foundation Grant, the College of San Mateo had some 200 cooperative education students in 1969. Some of the College of San Mateo's graduates have entered the space industry through electronics, while others have been employed with Lockheed Aircraft.

38. Letter from the files of the California Department of Aeronautics.

The aerospace-aviation industry of today requires employees from every identifiable academic discipline. While there is a tendency toward prominence of engineering, the sciences and associated technical areas, there still are found in the industries, graduates of the Business, Law, Medicine, Social, and Behavioral Sciences, as well as almost any other area of intellectual pursuit. The capable employee may indeed have something of each discipline in his background, while concentrating in one specialty to give him his on-the-job classification and entry to employment.

Another important aspect of the community college sector has come to the attention of committee members. That is, that in spite of the fact that an appreciable percentage of programs offered at the community college level are considered terminal, many students pursue their first two years of study at a local community college, get "turned on," and then continue their education by transferring to a four-year college. While the articulation of traditional course work into the four-year college programs is excellent, by and large this is not the case in the specialized area of aeronautics. Some standardization of course content, prerequisites, and units, appears necessary and inevitable.

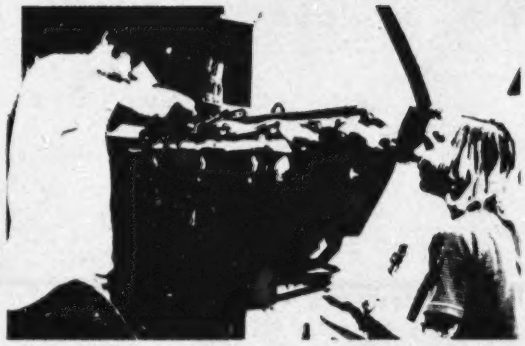
There are too many excellent programs in the California community colleges to permit singling out any one, or number for that matter, as being exemplary. Instead, we refer the reader to the listing of colleges on previous pages of this report, and to the 1968 and 1969 "Status Report(s) of Aviation and Aerospace Education in California" as published by the California State Department of Education.

Conservative estimates by the Department of Education have placed the number of students at the community college level who are involved in aerospace-aviation-aeronautics programs at approximately 10,728. With the emphasis on local accountability, the compilation of exact data is an almost impossible task.

Specific recommendations in the community college sector are listed on the following pages.

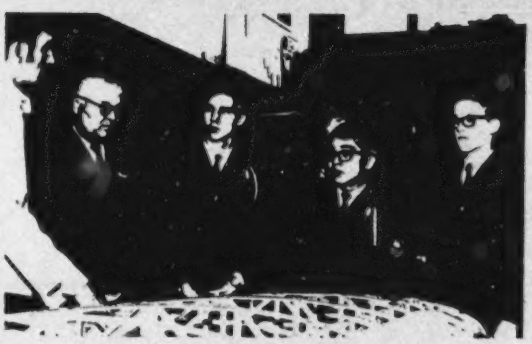
Recommendations

1. More of the State colleges should provide four-year aviation-aerospace sources, encompassing Business, Science, Airframe and Powerplant Technology, Flight, etc.
2. Related to the first recommendation, if one State college cannot arrange combination courses, then specialties should be started individually, with each different State college taking on only one or two.



3. Something must be done to standardize curricula. Until majors are offered in aeronautics-aviation at more of the State's colleges, it will be difficult for the community colleges to standardize their curricula. Once standardization is accomplished, the problem of transfer credits, in other words, articulation, will be eliminated.
4. Fixed-base operators surveyd have indicated strong sentiment that the community colleges, and more of them, should provide ground school, thus allowing the FBO to put his efforts into the flight training phase. The committee endorses this idea.
5. The problem of credentialing instructors must be dealt with for the community colleges. The committee expressed strong feelings that the entire credential structure should be eliminated, enabling the community colleges to employ teachers on the basis of the college's judgment, as is the practice in the State colleges, rather than remaining chained to a high school oriented credential system.
6. Industry should be encouraged to feed its needs into the programs at the colleges, and possibly develop incentives for students entering such programs.
7. Programs should be designed, especially at the community college level, to ensure that students will have the necessary skills required by industry.
8. Cooperative education, or joint industry-educational programs should be explored and developed to relieve educational financing problems.
9. Recommend the establishment and appropriate funding of a position within the California Department of Aeronautics, to advise on and coordinate the aerospace-aviation activities of the various education entities throughout the State. Working with this individual, there should be an advisory committee composed of representatives from the educational institutions, the industry, the Department of Education and the public, with the inclusion of students.

10. While this recommendation is not germane to the high school and community college levels, it nevertheless has merit and can have spillover benefits for those levels. With the advent of a much broader acceptance of air travel as a primary mode of transportation, more emphasis should be placed on aviation medicine in our schools of medicine. A corresponding, yet quite different activity would be the use of aviation medicine by the classroom teacher and college instructor to stimulate students in a host of health-related areas.



Colleges, Universities, and Private Schools

The primary objective of the colleges and universities is to present undergraduate and graduate instruction to qualified students in the liberal arts and the sciences, in applied fields, and in the professions, including the teaching profession. On many college campuses, research of a basic or applied nature has major significance. Most colleges consider extension programs, seminars, and other specialized education activities as their normal function. Aerospace-aviation by its very nature is a many-faceted activity, blending well into the broad and flexible organization of the college and university system. The capacity of the State's institutions of higher learning is tremendous, and if adequate support is provided, any specific need in aerospace-aviation can be met.

California has 36 public and private institutions offering undergraduate programs in engineering at the present time. Twenty-one or so of these colleges and universities are of a tax-supported nature (13 State college and 8 university campuses). The remainder are either private or tax-supported, but of a specialized nature, e.g., the United States Navy's Post Graduate School at Monterey. All of these colleges and universities may be considered as potential sources of employees for the aerospace-aviation industry. Graduate level programs are also available at many of these institutions, with degrees ranging from the Master of Science to the Doctor of Philosophy.

An engineering program being offered at any given college is not of itself a guarantee that the institution has specific course patterns leading to a degree in aerospace or aeronautical engineering. A nationwide analysis of recent vintage, and dealing with graduates of engineering schools for a typical year, revealed that only 5.9 percent of the BS degrees granted in engineering were in aeronautics, while at the MS level, the percentage was 4.3 percent and at the PhD level, 5.4 percent. Aerospace-aviation employers of engineering school graduates do not, by any means, restrict their hiring to the traditional aeronautical engineer. The needs of the industry embrace a broad spectrum of engineering talent. Thus, such areas as electrical, mechanical, civil, chemical, industrial, and systems engineering all provide a much-needed input from the professional engineer into the industry.

Even a cursory analysis of the curricula offered by institutions which have indicated particular interest in the aerospace field reveals the fact that they have an appreciable degree of latitude and discretion in establishing their programs. Such factors as faculty interest and talent, local requirements of industry, the opportunity for research, grants, accrediting agencies, and a host of other variables have helped shape curriculum patterns.

Research has played a major role in the development of the faculty, the facilities, and students at the University of California, and at several of the private universities, notably Stanford, Cal Tech, and the University of Southern California. The State colleges are less research oriented, and thus must cope with many more challenges than beset the universities.

The following institutions were found by the Task Force committee to offer programs specifically identified as aerospace or aeronautical within the framework of their engineering schools:

University of California

Berkeley	Los Angeles
Davis	San Diego

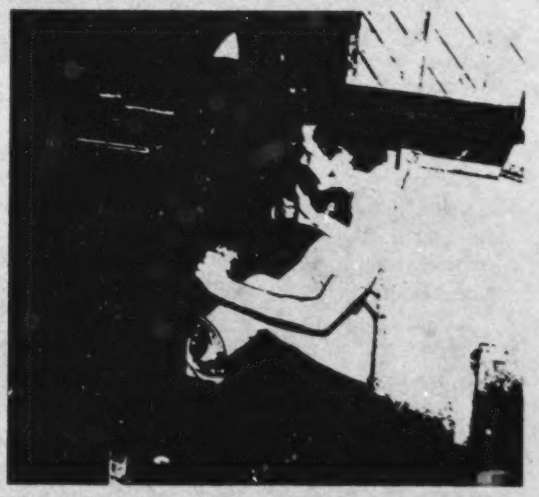
State Colleges

Cal-Poly, Kellog-Voorhis	San Diego State
Cal-Poly, San Luis Obispo	San Jose State

Private Institutions

California Institute of Technology
University of Southern California
Northrop Institute of Technology
Stanford University

Even from the nonengineering curricula, the aerospace-aviation industry presents career opportunities for graduates of many of the departments typical of a college or university campus. The accounting major from the school of business may find a place with McDonnell Douglas, working on the DC-10



project. The biophysics graduate may play a key role with NASA, evaluating life support problems in outer space. The industrial management graduate may find his place in the personnel requirements of United Air Lines, dealing with problems of a personnel nature. Graduates in aeronautical operations face the challenging choice of employment with general aviation or one of the air carriers. The aerospace-aviation

industry, in short, requires individuals from a broad spectrum of academia.

Several curricula have been especially oriented toward the aerospace-aviation field, and thus are unique and of some significance. They include:

University of Southern California. Its Institute of Aerospace Safety and Management offers a Master of Science Degree program in Systems Management. This program combines three disciplines – Systems Management, Human Factors, and Systems Technology.

Requirements for the program are set forth in a curriculum summary, as follows:

Systems Management	12 units
Human Factors	9 units
Systems Technology	9 units

Option 1 requires the completion of 10 required courses totaling 30 units, plus a thesis.

Option 2 requires completion of 10 required courses plus two elective courses, for 36 units.

California State University, San Jose offers two Bachelor of Science degree curricula in aeronautics, within the framework of the School of Engineering; one in Aeronautical Operations; the other in Aeronautical Maintenance. While the course content in the two programs resembles a typically engineering pattern, they are not classed as traditional engineering curricula.

The Aeronautical Maintenance curriculum includes a foundation in standard engineering oriented physics, chemistry, mathematics, and related subjects, complemented by aeronautics courses ranging from aircraft materials to aerodynamics. Stress is placed on maintainability and reliability.

The Aeronautical Operation curriculum requires preparation in mathematics and science, general education and aeronautics, combined with a comprehensive selection of business courses. Specialization is offered through three concentrations: Flight Operations, Maintenance Management, and Administration.

Institutions of higher learning in the State of California have traditionally been receptive to offering programs and classes meeting the needs of the local situation. In general, adult education is considered to be the prerogative of the high schools and community colleges. In many instances, however, particularly where extension or correspondence offices are incorporated in the college system, many educational opportunities have been offered "on demand."

For example, *Stanford University* has adopted a program using television to link the campus with professional engineers at work in the surrounding community. The plan was originally designed to minimize financial loss and wasted time when employed students attended on-campus classes. In determining the feasibility of this method, employees in selected local industries were asked to identify the type of subject matter required – with credit areas varying from the undergraduate business level to graduate level study in aeronautics and astronautics. Similar programs are in use at the University of Florida and at Southern Methodist University, just to cite two others.

The University of California's Institute of Transportation and Traffic Engineering is typical of the specialized activities of the University. The Berkeley campus of the University has extensive laboratory facilities located at the Richmond Field Station. Situated there are such aviation-oriented installations as a 1000-foot-long fog chamber for research in visibility. Among its other assignments, the Institute has activities relating to the planning and design of highways and air transport facilities, highway and airport engineering administration, economics, and finance.

Long Beach State College has earned a national reputation for the presentation of aerospace workshops designed to meet the needs of teachers. These are summer programs which have been offered for more than 17 years, and they do much to bring aviation into the "bag of skills" possessed by classroom teachers.

As a corollary comment, the Civil Air Patrol has done yeoman service in cooperating with, or sponsoring, a host of similar workshops and training sessions, often working with colleges and universities.

Actual flight activity or flight programs were found by the Task Force committee to be an area of primary weakness in the aerospace-aviation education system of California. No public institution at the four-year college or university level, and but few private colleges were found to offer flight courses as an integral part of the college curriculum. Some colleges do, however, offer programs in flight instruction. We shall examine two such programs.

Harvey Mudd College awards two-year aeronautical scholarships to nine students each year, through the auspices of the Bates Foundation. The objective of the program is not so much to develop professional pilots, but rather to assist students of this engineering college in gaining experience in the field of aeronautics through a unique flight program. Candidates for the scholarships must have the native ability and drive to become leaders in science and engineering. The Bates Foundation seeks to enhance their self-reliance, responsibility, judgment, and decision-making capability, and to add breadth to their personal development. While no academic credit is offered for completion of the course, an entry is made in the student's record.

Pacific Union College is a Seventh Day Adventist Institution, located at Angwin. It offers a broad selection of flight courses, ranging from Aero 16 — Private Pilot Rating, to Aero 156 — Technique of Mission Flying. Conventional academic credit is awarded for the satisfactory completion of these courses. Serving as a missionary aviation flight training center, it has the potential to train students for commitment to service in the very rewarding, productive, and exciting, SDA "Flying Peace Corps" concept. The domestic and international "goodwill" benefits are many and virtually unlimited.

Pepperdine University, an independent liberal-arts college, located in Los Angeles, has inaugurated a Bachelor of Science program in Aviation Management. The university was founded in 1937, with the purpose of educating the whole person to be a better citizen. Pepperdine offers the Bachelor's degree in more than 35 areas of emphasis, in 17 Departments, and the Master's degree in 12 fields. The University is fully accredited by the Western Association of Schools and Colleges, and work successfully completed at Pepperdine is accepted by other colleges throughout the Nation. Pepperdine's programs are designed to develop in the student the mastery of various fields of study, as well as an understanding and appreciation of our intellectual, cultural, and spiritual heritage, to help make sound judgments and intellectual commitments.

The Aviation Management program is based on a recognition of the present and future needs of aviation, and is conducted under the aegis of the School of Business. Regular faculty members of the School of Business, as well as specially selected experts in the field of aviation, conduct the program of instruction. A limited amount of work to be applied toward the degree may be taken in the Continuing-Education Centers maintained by the university throughout the Los Angeles area. Whenever sufficient enrollment can be assured, special classes may be set up in localities near the student population, permitting the student an opportunity to receive a part of his training at locations convenient to his home or business. The university utilizes a trimester plan of study allowing students to complete a regular semester's work (18 weeks) in a term of 16 weeks, with slightly longer than normal class periods. This provides for three equal trimesters each year. A student wishing to attend full-time can complete Bachelor's Degree requirements in two years and six months.

Course offerings include the following:

280A,	Private Pilot Ground School	3 units
480A,	Air Transportation System	3 units
551A,	Legal Environment of Aviation	3 units
482A,	Survey of Commercial Aviation	3 units
431A	Technical Reports	3 units

The student is required to complete other courses in Mathematics, Accounting, Economics, Principles of Management, Statistics, Computer Analysis, Management Communications, Principles of Marketing, Business Finance, Human Relations, Survey of General Aviation, and a Senior Seminar in Aviation. Upper division elective credits are granted upon proof of certification as a Private Pilot (3 units); Commercial Pilot (3 units); and Instrument Rating (3 units). A total of 42 units of credit are required for the major.

The Task Force believes that it is appropriate here to point out that flight activities are *not* foreign to the campuses of many of the major educational institutions of the Nation. Purdue, The University of Illinois, and Ohio State University, are outstanding institutions which have recognized flight instruction as a legitimate academic area, and have allowed credits earned in such programs to be applied toward a Bachelor's Degree. For example, Purdue offers a BS Degree in Professional Pilot Technology.

Ohio State University offers both ground and flight instruction, and conducts basic and applied research in the area of flight training, aero-medicine, and a variety of man/machine areas. The university operates a fleet of 20 aircraft, ranging from two-place trainers to Douglas DC-3s.

There is ample evidence here in California attesting to the interest that our students have in aviation. Many of the State's colleges have flying clubs which are, for the most part, not officially sanctioned by the college. In the State College system, the interpretation of Executive Order No. 82, dated October 21, 1969, effectively prevents flying clubs from obtaining recognition as on-campus student organizations. The Task Force is of the opinion that this interpretation is at fault, and is not in consonance with the true objectives of the Executive Order. Whatever the validity of the interpretation, participating students are deprived of the counsel and guidance of the conventional faculty adviser, resulting in sub-rosa flight activity which may be potentially dangerous to all involved. This same interpretation has effectively prevented the use of college-owned aircraft in the support of many instructionally related activities, such as research and surveys.

Army, Air Force, and Navy ROTC programs are available in many of the State's colleges and universities. Such programs are standardized to a large degree, while at the same time offering opportunities to the student to gain valuable specialized training. In some instances, flight training is available to the ROTC student, equivalent to that which is required for a Private Pilot Certificate.

Medical Schools offer a unique opportunity. Aviation medicine has evolved into an identifiable

area of specialization. The Task Force found that three California institutions offer lectures in aerospace-aviation medicine, but on an elective basis only. Those three are: The University of California School of Medicine, San Diego; The University of California School of Medicine, Los Angeles; and the Stanford University School of Medicine, Palo Alto. In the Appendix, the reader will find a treatment of aviation medical training considered suitable for adoption by the colleges, universities, and to a limited extent, the high schools of the State. Specific recommendations for the college and university level will be found on the following page.

Recommendations

1. The problem of coordinating the aviation programs offered in a number of California Community Colleges with those offered at four-year institutions is one of increasing magnitude. Student time and taxpayer dollars, both valuable commodities, are each involved. This problem must be solved. We recommend this as an area meriting study.
2. A correct interpretation of the Executive Order should be sought. The Order extended to restrictions on student travel by air, but is frequently interpreted as imposing sanctions against student flight activity.
3. Specialized programs in aeronautics-aviation are presently impacted. For example, at San Jose State College, despite a capability to accommodate more students in the program, there are restrictions as to the number of new students which might be allowed to enroll. This problem should be thoroughly investigated and a solution found.
4. Teacher-oriented programs should be organized and established, either as workshops or classroom activities, designed to facilitate the use of aerospace-aviation in imparting a broad spectrum of traditional knowledge (and not specifically vocationally oriented) to the student. Due care must be exercised, however, to not concentrate solely on science aspects, but rather to keep the program as comprehensive as practicable.
5. The problem of credentialing instructors must be thoroughly explored, with the possible assistance and advice from other States.
6. Colleges and universities have an obligation to offer continuing education and/or re-training to present employees in the aerospace-aviation industry. This is particularly pertinent at this time of upheaval and dislocation within the industry as the Vietnam war unwinds and contracts are canceled or economic measures are imposed. Support, encouragement, and to some degree, coordination should be afforded on a statewide basis.
7. All possible sources of funding should be explored in order that laboratory programs can continue to be adequately supported. Many of the colleges and universities need assistance in maintaining equipment or replacing obsolescent units.
8. The colleges and universities must be encouraged to develop new programs in aviation and transportation, multi-modal in their approach and multi-disciplinary in design. In other words, transportation is a total system and it must be studied in terms of the system, rather than as a distinct modal or disciplinary unit. There must be a strong and continuous relationship placing education between the individual and his adult role of work.

Industry and the Professions

It became evident early in the Task Force work that the various phases of aerospace-aviation education were inextricably entangled. None were isolated in a vacuum. The future of aviation, and for that matter, of all modes of transportation, depends upon the ability of all concerned to develop an educational program that will:

- Respond to man's eternal quest for independent mobility. Recent successful Apollo flights are a dramatic example of the technological "know-how" resulting from that quest.
- Provide a transportation system which will enhance the quality of life. There is presently a major gap between the technological "know-how" and the public good. That gap must be filled. We must insure that technology serves, rather than victimizes man.
- Provide career opportunities and lateral and vertical mobility throughout all modes of transportation. Severe dislocations of highly trained manpower, such as recently experienced in the aerospace industry, vividly illustrate the need for a career-oriented education, instead of one narrowly concerned with jobs.
- Develop a public understanding, acceptance, and ultimate support for new developments in aviation and transportation. The global nature of the nation's transportation system, responsible for roughly 20 percent of the Gross National Product, and the complexity of the technology involved, constitute a challenge for all of our political, economic, social, and educational institutions. They must take into account, not only the (1) *Technological Systems*, but more importantly – and perhaps what is far more difficult to accomplish – (2) The *Support Systems* – that is, the legal, economic and educational arrangements through which such technology is subjected to social control – for understanding, acceptance, and ultimate support for the technological system contemplated. In addition, the State and National leadership must focus attention on (3) the *Manpower System* which will be necessary to operate the transportation system.

The transportation system of today is, and will continue to be in our future, a man-machine system. Man is both the creator and the creature of that system. Complexities of technology have created a new relationship between man, his education, and his work in the transportation system. Whether he is the designer, the planner, the manager, the operator, the user, or the benefactor of the transportation system, the educational requirements are complex and constantly shifting. This demands a massive response by the total educational community, at every level – both in formal classroom arrangements and in a variety of school-community situations.

In the face of that demand, the Federal Aviation Administration and the United States Office of Education have recently joined together in efforts to sponsor a national project to provide *Guidelines* for an *Intermodal Transportation Curriculum.* Objectives of the project are:

- To identify the technical careers emerging in all areas of transportation.
- To identify the areas of training appropriate to the community colleges and the kindergarten through high school (K-12) programs in the transportation area.
- To develop a core of educational experiences appropriate to all programs in transportation education.
- To identify levels of technical training at the Community level with representative tasks and skills for each level.
- To analyze the intermodal aspects of the transportation area, and
- To identify the potential technical career ladders from the community college level, down through the secondary school programs, with mobility to be considered both upward and laterally throughout all modes of transportation.

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The Task Force recognizes the complex nature of the technology in our transportation system and its implications for education. In view of the fact that the State of California is responsible for the education of its citizens, the Task Force recommends that the efforts in the State of California, with respect to aviation activities in the State, be broadened and expanded to provide a transportation education program responsive to the needs of the society which must be served.

During 1969 and 1970, a survey was conducted to ascertain from employers in the aerospace industry their views of what was needed in aerospace (and aviation) education, and to elicit from them their critical comments on the adequacy of the present educational system. As might well be anticipated, there was no unanimity of opinion held by the employers, but there was enough agreement that a general consensus could be extrapolated. Some of the questions and typical responses are included in the following pages.

There were some 30 responses, and the opinions

expressed in replies to various questions ranged the full gamut from enthusiasm to discouragement. Correspondents included educators as well as industry, and the inquiry was aimed at defining the needs of the student population as related to current and future aerospace environmental factors; investigating and tabulating those processes utilized by industry, the military, and our public and private schools in aerospace education and/or training activities – insofar as they might lend themselves to the development and ultimate demonstration and evaluation of the effectiveness of a high-interest-level aerospace curricular program for elementary and for secondary school students. The survey further stated:

> Our established ultimate objective is to investigate, plan, establish, demonstrate, and evaluate through the cooperative efforts of industry and education, the effectiveness of a high-interest-level aerospace-oriented curricular program for elementary and/or secondary school students.

Not all respondents replied fully to each of the five questions asked, nor did they limit their reply to simply answering the five questions. Some introduced their response with weighty and learned prefatory remarks, including basic assumptions upon which their statements were predicated. Some relied heavily on experiences of the past, and others were more deeply influenced by considerations of the present and anticipations of the future. The gist of the replies may be summarized as follows – keyed to the questions:

(a) Considering among others, the factors of technology, societal trends, modern scientific efforts, etc., what do you see as the *needs* of current and future American society relative to aerospace education?

Reply: The *needs* of current and future American society cannot be strictly segregated to aerospace education. What current and future American society needs is an informed citizenry, fully aware of its surroundings, appreciative of its technology, cognizant of its opportunities to improve living conditions, and determined that every available means shall be applied in the effort to benefit mankind. The student must be equipped to take his place in the world and enabled to occupy himself in a meaningful occupation. This requires a solid foundation in a variety of subjects, the ability to cope with change, and adapt to conditions which do not remain static, and the flexibility to adjust to the world about us. The ability to communicate with others is essential, and hence any curriculum should concentrate heavily on the communicative skills.

Reply: It must be acknowledged that our schools do not represent the ultimate in education for every student. Some students will not finish high school. Some will go directly from high school into the work world, while others will go on to colleges and universities. Some few will go beyond, into graduate levels of education and individual research. Still others, after leaving college, will be further educated in on-the-job, or industrial development programs.

One respondent cited the number of high-school-diplomaed individuals without useable skills, and with an inadequate foundation upon which to base the acquisition of those skills.

Several categorized this as the age of specialization. Because of the complexity of devices and even the professions, this has become an accepted situation. But conditions do change, and career opportunities disappear. If the specialist cannot adapt to change and enter other fields of endeavor, he risks joining the unemployed, probably swelling the welfare rolls. It thus should be obvious that society needs well-rounded individuals who are totally aware of the world around them.

This should not, however, be accepted as dismissing the contributions of aerospace education. Every citizen benefits from an understanding and awareness of his environment. In this, the air age, the aerospace-aviation fields are a significant part of that environment. Transportation relies heavily upon aviation and the aerospace industry. Passenger and cargo movements increasingly go by air. Every student must participate in a learning process bent on revealing the limitations and capabilities of air traffic and transportation. Vocational goals must be considered and technical schools can furnish a good foundation for the terminal student in our high schools.

In the interest of maintaining local autonomy, the schools must develop courses of instruction which are appropriate for the environment – their local situation. Aerospace-aviation education should be as fully implemented as any other curriculum, and there should be a concentration on the sciences without abandonment of the arts.

(b) Should education and industry participate jointly in the definition of educational and/or training programs? If so, what advantages in terms of general student benefits might be realized?

Reply: There definitely should be partic tion. The degree of such participation, however, should vary. Industry should be involved in consultative roles. The initiative should rest with the schools, and administrators should be required to periodically consult with leaders in industry – and not just one industry – to determine the adequacy of the existing school system, or its deficiencies, and what can be or should be done to remedy unsatisfactory student preparation. In view of the tendency to concentrate upon needs of their particular field, industrial leaders

might overly stress certain areas, and minimize others. The liaison should, however, be established – and maintained. The effort should be sincere, and the cooperation must be unstinting.

Advantages to the student could include more relevancy of the curriculum and an easier transition from the high school to either industry or to higher educational institutions. The training programs need not be solely conducted in the schools. Many institutions employ widely the work/school integration program concept. This can be done throughout the year, or during vacations. Simple skills may readily be acquired and a work force may be tailored to the demands of the local industry.

(c) Another of the questions dealt with "experimental schools," "yardstick schools," or "competitive schools" and their place in our educational system.

Reply: Schools of this nature fill a needed place in our educational system. There are, however, pitfalls in such innovative endeavors. An individual may be so highly specialized in his school years that future cyclic changes in the work force may dictate technological insufficiency, and add to the unemployed rolls. These institutions also tend to benefit only those students in a particular area – depriving others of the same opportunities. Students who are subjected to the curricula in such institutions do not have a second chance to go through school again with a broader-based curriculum. Rather than developing such schools and programs, it would be advisable to ensure more readily available aerospace-aviation courses in *more* of the existing schools.

(d) "...what is your opinion concerning the effectiveness of those tools used by industry such as System Analysis, P.E.R.T., C.P.M., Fault Tree Analysis, etc., as a method, compared to the contemporary curriculum development processes?"

Reply: In any effective school system, such processes must be employed in a continual review procedure to analyze effectiveness of curricula. Such "tools" have left the ranks of the esoteric and have joined the lists of the widely used. Caution is required, however, in selecting those who will use such analytic aids. A little knowledge is a dangerous thing, and thorough training and grounding is required for those designated to develop meaningful and relevant curricula. As one respondent indicated, "...such tools are merely 'organized common sense'..." Considered judgment, a willingness to innovate, and the ability to apply common sense, are essential characteristics for those curriculum developers – especially in view of the effects their actions will have on the lives of others. Experimentation should be encouraged, but not to the detriment of the basic foundations in the arts, sciences, and communicative skills.

(e) "...outline your position relative to (1) what you perceive as relevant education, (2) is it an essential ingredient of an educational/training program, and (3) can the aerospace environment be used as one alternative to enhance education through relevancy?"

Reply: This three-pronged question is somewhat loaded. To answer part 1, I conceive of relevant education as that which equips the student to take his place in the real world. It cannot be relevant only to the student. Neither can it disregard his opinion. It must be relevant to those users of manpower who might possible employ the student at the end of his schooling. It should be totally relevant to society in general.

Part 2 is somewhat easier. It definitely is an *essential* ingredient of any and all educational or training programs. Relevant education can overcome dropout tendencies, can grip the attention and interest of the student, and can develop students prepared to make a meaningful contribution to society.

Part 3 is the loaded part. The aerospace environment should not be considered as one alternative. It takes its place among all the other course offerings making up a curriculum. It has been thoroughly proven to have a motivational effect on some students. For others, it might not be as effective. It can, and there is little disagreement on this, add to social awareness. Skills which are useful in the aerospace environment are not restricted to use in that field alone. They are useful in almost every category of endeavor. Much of the protest on college campuses today had its origin in discontent with curriculum content as not being relevant to the real world. Tradition has its part, but tradition cannot inspire in every case. The student today demands to be told "like it is," and this is a plea for relevant curricula.

The inquiry originated in the California State Department of Education, and responses came from many sources, including the following:

The National Aeronautics and Space Administration (NASA).

The United States Air Force Academy.

The Department of the Air Force, Professional Education Division, Deputy for Personnel Training and Education.

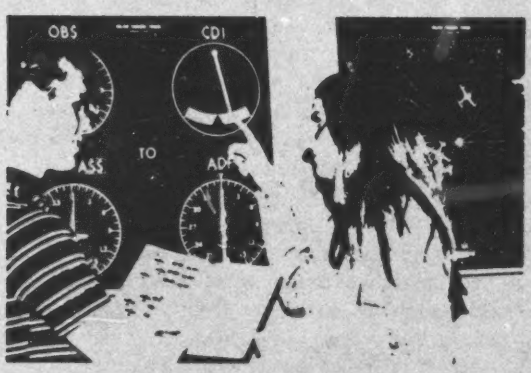
The United States Air Force, Air Training Command.

Stanford Research Institute.

McDonnell Douglas Astronautics Company, Western Division.

State of Washington, Superintendent of Public Instruction.

Ryan Aeronautical Company.
Ling-Temco-Vought, Education Systems, Inc.
Bioscience Planning, Inc.
Cal-Tech, Jet Propulsion Laboratory.
Thompson-Ramo-Woolridge, (TRW).
Kansas Commission on Aerospace Education.
Cessna Aircraft Company.
Systems Development Corporation (SDC).
Radio Corporation of America (RCA).
Bendix Corporation.
George C. Marshall Space Flight Center, Huntsville, Alabama.
Space Division, North American Rockwell.
LeRoy R. Rosen, Rosen Associates, Systems Management.
International Business Machines, Corporation (IBM).
San Jose State College.
Cornell Aeronautical Laboratory, Inc.
Air Force Association, Aerospace Education Foundation.
Institute for Defense Analyses.
NASA's Manned Spacecraft Center.
The Aerospace Corporation, Los Angeles.
The University of California at Irvine.
Hughes Research Laboratories.



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Please note that considerable liberty has been taken with specific responses in order to compile a consensus of most of the replies. No inference is made that each of the respondents cited fully supports the conclusions drawn from the replies to the survey questions.

The present Administrator of the Federal Aviation Administration told Governor Reagan in a letter dated October 10, 1969 that he was convinced that many of today's problems stemmed from a lack of sufficient educational experiences and opportunities for the typical citizen and aviation and aerospace participant.[39]

In 1969, Dwane L. Wallace, Chairman of the Board, Cessna Aircraft Company, delivered an address on "The Importance of Air Age Education . . . The Present Status . . . And Future Needs from an Engineering Standpoint." Excerpts from that address are pertinent to this report of the Governor of California's Aerospace-Aviation Education Task Force. Among other things, Mr. Wallace pointed out that:

> . . . let me remind you that right now, the year 1990 is the same distance away from us as the year 1948. And I submit to you that progress in our business will be multiplied between now and 1990 when compared to our progress since 1948.
>
> Let me remind you also that most of you have children who will spend the most productive years of their lives in the 21st century. . .
>
> . . . Who is going to be buying our products in these years to come? What attitude is the public going to have about our business? How can we best educate people to the advantages and purposes of general aviation?[40]

39. For full text of the letter, see appendix.

A Look to the Future

A new thing has happened. Like many truly new things, it has nearly escaped notice.

On July 23, 1972, a McDonnell Douglas Delta launch vehicle arose from Vandenberg Air Force Base, California, and took into an Earth orbit of just under 570 miles a satellite named Earth Resources Technology Satellite-1 (ERTS-1). It was built by General Electric in a variation of its highly successful Nimbus weather satellite. Aboard this spacecraft are a variety of subsystems, most prominently including cameras and other sensors developed and delivered by Hughes and RCA, with the assistance of many subcontractors and suppliers.

Just what this event means to all of us is that mankind has begun to get information that will fit into the first global inventory of resources. What is new is the fact that today, cameras and other sensors are providing single pictures that provide more information than formerly could be gleaned from up to 1000 photographs taken from an aircraft and laboriously matched together into a mosaic.

ERTS-1 is providing answers to questions such as the following:

> Where are the forest fires on Earth?
> Where are blight or other diseases attacking forests and agricultural crops?
> Where are mineral and oil resources likely to be found?
> Where is the pollution of air and water occurring?
> Where are the fresh water resources on Earth?
> Where is urban growth occurring, and how is it impacting on the environment?

40. Remarks extracted from Mr. Wallace's speech.

In its near-polar, sun-synchronous orbit, the 1965-pound NASA spacecraft circles the globe every 103 minutes, completing nearly 14 orbits daily. Every week it surveys more that 42 million square kilometers, sending back images of the Earth's surface that are 115 miles square. Thus, the entire globe, with the exception of some areas near the poles, is covered every 18 days.

In addition, a data collection system aboard the satellite is gathering signals from 150 automated platforms at as many ground stations in various remote areas of North America. This environmental information — measurements of air pollution, rain and snow fall, rate of stream flow and other physical occurrences — then is relayed through telemetry to NASA ground stations. NASA's Goddard Space Flight Center at Greenbelt, Maryland, processes nearly 10,000 color, black and white, and digital tape images every week for ERTS experimenters — more than 300 of them from 37 countries.

According to the British scientist Dr. Fred Hoyle, a major turn in human history occurred when we saw our first photographs of Planet Earth, taken from deep space, crystallizing our awareness of our own planetary fragility, the limitations on our resources, and the imperative necessity of learning exactly where we stand and how we should proceed. We are enabled to do these things because we have developed, within little more than a decade, a technology previously unimagined. We can see with precision what resources we have — what waste we have worked, and what exists that we have previously been unaware of, or have ignored.

ERTS-1 has a design life of one year, and will be followed by a second in the series (ERTS-2), launched late in 1973, demonstrating that the space effort has been, and continues to be, one of America's best investments.[41]

Some of the near-term objectives of the ERTS domestic program include:

Development of a geologic and soil-feature map of the United States.

Development of an agricultural map of the United States.

Evaluation of vegetation damage from highway construction in Maine.

Compilation of information on the dynamics of Lake Ponchartrain, Louisiana.

Determining the ability to observe control measures for pink bollworm infestation of cotton in California's Imperial Valley.

Evaluation of land use in the great urban megalopolis which stretches from Boston, Massachusetts to Richmond, Virginia.

Inventory of timber resources in selected forests in the United States.

Studying ecological changes taking place on the United States East Coast.

Acquiring information needed to plan protection of tidal marshes.

Acquisition of comprehensive information on the use of public lands in the Western United States for grazing purposes.

Foreign scientists have proposed other ERTS experiments, including:

Detection of potential locust breeding sites in southwest Saudi Arabia.

Snow surveys to assess the risks of spring flooding in Norway.

Land use and soil erosion in Guatemala.

The hydrologic cycle of the Santa River basin in Peru.

Winter monsoon clouds and snow cover in Japan.

Survey of a variety of resources in India.

Scientists participating in the ERTS program are from Australia, Brazil, Canada, Chile, Colombia, Ecuador, France, West Germany, Greece, Guatemala, India, Indonesia, Israel, Japan, South Korea, Mexico, Norway, Peru, Republic of South Africa, Switzerland, and Venezuela. Each nation will fund its own experiments.

The ERTS program has taken on a truly international flavor, representing a new emphasis on improving life on Earth, using technology for the benefit of all mankind.

The foregoing has been cited in order to show the positive values derived from modern technology. But such programs are not limited to satellites and space wizardry.

While the national trade balance has gone from surplus to deficit, the aerospace trade balance has been going steadily up. Further, the aerospace industry has been a member of "the $2 billion export club" for six years, and last year qualified for the $4 billion club. This proves that when it comes to technology, America still leads the way, and has every right to demand a trade policy that permits the aerospace industry to keep and expand its lead. President Nixon supports that kind of trade policy.

Trade policy is different from other aspects of foreign policy: it stands or falls on the ability and willingness of specific domestic interests, such as the aerospace industry, to understand and support it.

Trade policy is now, and always has been, a local as well as an international issue in the United States. And this is just as true now in Japan and in Europe. The foreign policy objective of the Nixon Administration is to see the construction of a new global economic superstructure to go with the political superstructure the President has built in his first term.[42]

41. *On a Clear Day You Can See Forever, and Serving Mankind — Eyes in the Sky*, by Karl G. Harr, Jr., President, Aerospace Industries Association, AEROSPACE, Vol 10, No. 4, October, 1972.

42. *Technology and Trade — a Place of Honor in History*, by Ambassador William Eberle, the President's Special Representative for Trade Negotiations, AEROSPACE, Vol 10, No. 4, October, 1972.

"We must set in place an economic structure that will help and not hinder the world's historic movement towards peace. We must make certain that international commerce becomes a source of stability and harmony rather than a cause of friction and animosity."[43]

Advanced research – and the ability to sell it abroad – accounts for the tremendous contribution the aerospace industry has made to our trade balance. But trade policy alone cannot determine the level of federal spending on research. It's not a big enough tail to wag *that* dog. Something more is needed than balance-of-payments arguments to restore the level of research expenditures. The United States must remain the world's most exciting center of technological innovation. Take that away and you take away one distinguishing and irreplaceable feature of our culture, one that gives us a right to claim a place of honor in the history books. This, not the balance of payments, is the best argument.

Many people do not understand how profoundly federally-sponsored research has affected the rate of technological innovation in our society, and the trade benefits that spring therefrom. The spinoffs that have taken place within corporations, and in universities, too, far exceed the list of patents that can be traced directly to that research. We seek to preserve and expand the notion that comparative advantage must be determined by technological innovation, entrepreneurial skill, and productivity.[44]

Eighteen percent of the aerospace products manufactured here in the United States are exported, as compared to only seven percent of all United States products exported.

It should be obvious to the reader that technology plays an increasingly important role in determining the position of the United States as a leader. It should also be obvious that without a trained manpower pool the technological leadership of the United States would be irrevocably and irretrievably dissipated. One of the major purposes behind the drive to insure a rightful place to aerospace-aviation education is to facilitate the maintenance of just such a trained pool of manpower – a pool of citizens who are aware of the world around them, appreciative of technology, and knowledgeable of aerospace-aviation's contributions to that technology.

On April 15, 1972, the Gill Robb Wilson Memorial Aeronautical Science Center was dedicated at Embry-Riddle Aeronautical University in Daytona Beach, Florida. The University was founded in 1926, and is hailed as "the only accredited, private, non-profit, co-educational, totally aviation-oriented university in the world today." It might be appropriate here to quote from the university's catalog.

"A nation that once depended on wheels has grown wings. The world of aviation has expanded with the speed of a jet . . . creating jobs and careers that didn't exist even a generation ago. The sophisticated technology that is aviation today requires formal education and training. Those who have the courage to seek a unique, overall life style must have the foresight to prepare for it . . . Aviation has built-in motivation."[45]

The Gill Robb Wilson Memorial Aeronautical Science Center houses a Simulator Laboratory, a Technical Library, Classrooms, Flight Planning Rooms, Aviation Weather Facilities and Faculty Offices.

Education, especially aviation education, is a serious business. There is no short cut to success, nor will a diploma guarantee a job. But, a formal education is a requirement in most areas of aviation. The future belongs to those who prepare for it.

In dedicating the Center to the memory of Gill Robb Wilson, Embry-Riddle honored an individual who was truly one of the pioneers in aerospace-aviation education. Mr. Wilson had begun his aviation career not long after the Wright brothers successfully propelled their flying machine above the ground. He flew as a pilot with the French Escadrille 66, transferring to the U.S. Second Army Bombardment Group after United States entry into World War I. He covered World War II for the New York Herald Tribune as a war correspondent and aviation columnist. He was chairman of the first Aeronautics Committee of the American Legion, was the Director for 15 years of the New Jersey Department of Aviation, and was a consultant to the Government of the United States on lighter-than-air developments. He conducted the first national airport survey and was four times president of the National Aeronautic Association. He was a co-founder and Director of the Aircraft Owners and Pilots Association (AOPA), and also served as president of the National Association of State Aviation Officials (NASAO). He created the plans for the Civil Air Patrol and organized it nationally. Mr. Wilson also served as President of the United States Air Force Association; was a consultant to the Training Command of the United States Air Force, and for 20 years was a consultant to the Air Force and the Department of Commerce. He also was a member of the Congressional Aviation Policy Board and vice-president of the Air Force Historical Foundation. For many years he was editor and publisher of Flying magazine. Mr. Wilson's philosophy can be summed up in the quotation that "He who dedicates himself to a great ideal – himself becomes great." During the dedication ceremony, Gill Robb Wilson's "The Atmosphere" was quoted. It is repeated in the following column.

43. Richard M. Nixon, the President, from an address to the representatives of 124 governments at the annual meeting of the International Monetary Fund and the World Bank.
44. Eberle, op. cit.
45. Excerpt from the introductory notes of the Bulletin of Embry-Riddle Aeronautical University.

THE ATMOSPHERE by GILL ROBB WILSON

Essential to life upon our planet
is the broiling blanket of the atmosphere,
the all-encompassing air ocean, whose
nearer shore is the land and sea beneath,
and whose farther shore is outer space.
Redeemed from ageless mysticism
by the pressing curiosity of man, the air ocean
is become lordly to human destiny
in fact as once in fancy.
Eternally in motion, here rises the shield
against the cosmic avalanche,
here filters the sun of poison,
here brews the climate of harvest.
And here at long last
is the physical medium of one social family.
Not since time began has civilization been
so challenged in mind and spirit to exhaust
the potential of the physical universe
as in the air age. Nor is this challenge
one of easy accomplishment.
A heart for the unknown,
a courage for the unexpected,
and a will to see over the next hill
these are essential equipment of the airman.
Yet the rewards are unparalleled . . .
frescoes of cloud and shadow
such as man never painted,
the grip of forces such as man never created,
a sense of freedom such as man never dreamed.

We of the Governor's Aerospace-Aviation Education Task Force warmly endorse the philosophy called out in Gill Robb Wilson's writings. We note his reference to the environment and his accolade to those embarking on careers in aviation.

We trust that the reader may be motivated to encourage the student to pursue aerospace-aviation education in the full realization of the benefits deriving from space-age technology. From knowledge comes power — the power to improve the lot of all mankind. The past is prologue to the future, and the future, again, truly belongs to those who are prepared for it.

Aviation Education in the Soviet Union — an Overview

We are indebted to Dr. Mervin K. Strickler (Immediate Past President of the National Aerospace Education Association) and Jack R. Hunt (President of Embry-Riddle Aeronautical University) for the following information concerning aviation education in the Soviet Union. President Hunt and Dr. Strickler are currently writing a book on "Understanding Soviet Civil Aviation," and they plan to take a group of college students to the Soviet Union for another Civil Aviation Seminar in July, 1973. The observations in the following passages were made during their 1972 trip to the Soviet Union.

Based on visits to key educational and training facilities, and on interviews with leading Soviet aviation and education officials — both in the Soviet Union, and while some of them were visiting Embry-Riddle Aeronautical University in the United States in November, 1972 — we are convinced that Soviet aviation progress in the past owes much to education. Further, the future of Soviet civil aviation is closely linked to dependence on a detailed and careful plan of making the fullest use of the latest techniques of education.

Soviet aviation personnel of tomorrow are in large and modern vocational, technical and professional educational institutions and facilities. Many of the USSR's highly trained aviation personnel are enrolled in a common curriculum for part of their training — whether they are going to be air traffic controllers, maintenance technicians, pilots, flight engineers, or civil engineers doing aviation-oriented work. This common curriculum approach helps to assure that all will understand the various systems with which they will work.

There is great and early competition to enter aviation studies on the part of Soviet youth. Likewise, people already in aviation are regularly encouraged and given opportunities to up-grade their skills. Our visits to many educational facilities demonstrated several points:

- High priority is being given to the design and construction of the finest educational facilities devoted entirely to aviation.
- Cybernetics is required instruction for all higher education personnel in the 6000-student Kiev Civil Aviation Institute — with students from 40 nations as well as all parts of the Soviet Union.
- Classrooms and lecture halls feature the latest multimedia equipment and resources, including closed-and open-circuit television and individual response systems.
- Computer systems of a sophisticated nature are used for regular instruction to students. At Kiev, the same computer system is used to provide real-time experience for training of graduate students as is used by and linked with the Tupolev Design Team in Moscow, which is conducting operational analysis of the TU-144, the Soviet civil supersonic airliner.
- Widespread use of flight simulators is

apparent in higher educational institutions such as the Civil Aviation Academy in Leningrad.

- When you visit a radar repair, trouble-shooting, or maintenance laboratory in an institution of higher learning, you do not see obsolete equipment. For example, we made exhaustive study of aircraft such as the IL-62, intercontinental jet, and the YAK-40, tri-jet, as well as many others. In every instance, those studying the various systems in the college or university use the exact duplicate of the component system that is on the operational aircraft – whether it be radar, communications equipment, computers, instruments, hydraulic, electrical, refrigeration, or propulsion systems.
- Pay scales for those in aviation technical work are above average, and in some instances, exceed the pay of medical doctors.
- There is great motivation to make Soviet aviation competitive by meeting and exceeding ICAO standards.
- There is much emphasis placed on learning English for aviation operations outside the Soviet Union.

Much of the Soviet civil aviation progress is due to the high place which the Ministry of civil aviation occupies in the government. Moreover, Aeroflot, the Soviet airline, places great stock in having careful and detailed education for its workers. Thus, when you visit the Soviet jet-engine and airframe-maintenance plant outside Moscow, where more than 20,000 workers are employed, it is evident that education is used, even in industrial plants, in preparation for jobs, and for on-the-job training and up-grading.

Both large educational institutions such as the Civil Aviation Institute in Kiev and industrial plants, provide nursery schools for the children of workers, faculty, and students. Hospital and medical services are also provided on, or near the site, and operated by the particular institution. In short, maximum efforts are being expended to assure the fullest possible efficient use of human, as well as material resources, in both educational institutions and aviation industrial enterprises.

Soviet young people study aviation and space history in school and they learn of the early training and subsequent attainment of aviation and cosmonaut heroes.

Our study of Soviet civil aviation clearly shows that there are significant accomplishments in Soviet aviation education at all levels of education, and in industry. With the Soviet Union now a member of the International Civil Aviation Organization (ICAO), it is anticipated that many significant developments will take place in their training, education, and competitive position in world aviation.

Our visits to air traffic control facilities, and our discussions with both governmental and aviation or educational officials, along with our study and observation of their aviation educational institutions, show clearly that the Soviet Union has achieved a very high point in adapting and using educational techniques and programs to further their civil aviation goals.

In our visits with Soviet government, Aeroflot, educators, and other people, we found an open and friendly reception. We could ask for information on any topic related to education and civil aviation developments and receive frank, factual, and technically adequate responses. All of our visits included opportunities for freely photographing their equipment and training facilities, and making lengthy tape recordings of our discussions. When the Soviet delegation accepted the invitation of Jack Hunt to visit Embry-Riddle Aeronautical University as guests, the Soviets were pleased to find that they were treated with the same kind of hospitality and openness. They visited Embry-Riddle Aeronautical University; Federal Aviation Administration Air Traffic Control facilities in Daytona Beach and Orlando, Florida; Cape Kennedy Space Center; Eastern and National Airline facilities in Miami, Florida. This visit, the first of its kind between Soviet and United States educators and aviation officials, heralds a new and helpful relationship between two of the great countries of the world – two which have made so many contributions to aviation on a worldwide basis.

We are hopeful that in the years to come, there will be exchanges of students and faculty between our countries, and that there will be many more opportunities for this kind of free exchange of ideas.

Mervin K. Strickler, Jr.
Immediate Past President
National Aerospace
Education Association

Jack R. Hunt, President
Embry-Riddle Aeronautical
University,
Daytona Beach, Florida

Appendix 1

The Governor's Aerospace-Aviation Education Task Force

DON H. CLAUSEN, Chairman

Member of Congress since 1963, from California's First Congressional District; Serves on the Congressional Committees for Public Works, Interior, and Insular Affairs; Charter member of the California Association of Airport Executives; Member of the National Advisory Committee for Embry-Riddle Aeronautical University; President of the Congressional Flying Club; Member of the Del Norte County Board of Supervisors for seven years; Operated an insurance business and an air-ambulance service; WW II Navy Carrier Pilot; Manager-operator of the Del Norte County Airport for eight years; Flight instructor and pilot examiner; Co-founder and advisor in the establishment of Del Norte County High School's aviation education program.

H. GENE LITTLE, Vice Chairman

Associate Professor of Aeronautics at California State University, San Jose; B.V.E. Vocational Education, San Jose State College; M.A. in Industrial Studies, California State University, San Jose; Vice President, Education and Training for World Airways, Inc.; Metropolitan Director, National Alliance of Businessmen; Dean and Director, World Institute of Aeronautics; Chairman, Aeronautics Department, College of San Mateo; Past President, California Aerospace Education Association; Aviation Advisory Committee member for Foothill, Alameda, San Joaquin-Delta, and Chabot Community Colleges; Recipient of the Paul Mantz Award of the California Aerospace Education Association for "Outstanding Contributions to Aerospace Education" for 1968.

JOSEPH R. CROTTI, Secretary

California Director of Aeronautics since 1967; Member, California Association of Airport Executives; Provisional teaching credential in adult education; Former deputy-chief of the Merced Fire Department; Experience in the engineering department, City of Merced; Director of the civil defense and disaster office in Merced; Manager of Merced Airport; City-Manager Pro Tem for Merced from 1964 to 1967; Member, American Institute of Aeronautics and Astronautics; Past President, National Association of State Aviation Officials.

HARRIET E. PORCH, Director

B.S. in Business Administration in Airline-Airport Management; Masters Degree in Transportation; Editor and Staff Researcher for the Rand Corporation; Link-trainer instructor for the United States Navy; Lt. Commander, Naval Reserve, as Administrative Officer for an Air Intelligence Unit at Los Alamitos Naval Air Station; 5 years experience with United Air Lines in flight and ground safety; Member, National Aerospace Education Association and California Aerospace Education Association; Member, Superintendent of School's Aerospace Education Advisory Committee; Chairman, Los Angeles Chamber of Commerce Women's Space Symposium; Member, Faculty of Pepperdine University.

J. FLOYD ANDREWS, Director

President, Pacific Southwest Airlines for the past ten years; attended Wichita State and Friends Universities in Kansas; World War II volunteer pilot with the Royal Air Force and the United States Army Air Force; Flight Instructor; Airline Pilot; Member, National Alliance of Businessmen (NAB), and Chairman for the San Diego area; Member of the California Tourism and Visitors Services Commission; Member, Governor's Task Force on Transportation; Member, Board of Directors, California Chamber of Commerce; Member, Urban Coalition and Management Council for San Diego; Member, Board of Directors of the San Diego Convention and Visitors Bureau; Member, Board of Directors for COMBO; Member, Board of Directors, San Diego Gas and Electric Company; Serves on the Economic Development Corporation for San Diego County; 1968 Honorary Chairman for the San Diego Multiple Sclerosis Society's fund raising campaign; Member, Board of Directors of the Institute of Medical Sciences in San Francisco.

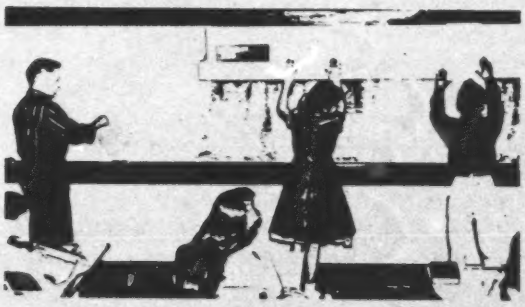
MYRL C. RUPEL, Director

B.A., La Verne College; M.S., University of Southern California; Doctorate from U.S.C.; Superintendent, Perris High School District; former Superintendent, Tehachapi Unified School District; Past President, California Aerospace Education Association; National Director, Flying Educators; College teaching experience at U.S.C., Bakersfield, and La Verne College; Author, "What Every Teacher Should Know," "Cardboard Jungle – Elementary Administrators," "Sketchbook of Soaring Flight," "See and Be Seen,"; Commercial Pilot, Airplane, Single and Multi-Engine Land, and Gliders.

THOMAS E. LEONARD, Director

Professor of Aeronautics, California State University, San Jose; B.S., Aeronautical Engineering, California State Polytechnic College, San Luis Obispo; M.A. in Education-Aeronautics, California

State University, San Jose; Specialized studies in aircraft accident investigation, U.S.C.; Special area of activity in aircraft maintainability, theory of propulsion; Consultant in special areas, such as standards of maintenance for aviation, techniques and methods; Formerly employed in crop-dusting and with Hiller Helicopters, Lockheed Missiles and Space Company, and United Air Lines; Member, American Society for Engineering Education; Member, Aviation Advisory Committees for Gavilan College and Victor Valley College; Member, Aviation Technician Education Council; Member, National Aerospace Education Association and California Aerospace Education Association; Member, Monterey Bay Area Aviation Advisory Board, and Member of the Advisory Boards for several other colleges.



ELMER O. HASKIN, JR., Congressional Liaison

58 Sales Manager for KIEM-TV; Responsible for congressional liaison between Task Force members and Congressman Don H. Clausen (Chairman); Military service with the United States Marine Corps; Attended Humboldt State College and the University of Southern California; B.A. in Radio-Television-Speech; Private Pilot, Airplane Single and Multi-Engine ratings; Chairman, Aviation Advisory Committee for the College of the Redwoods; Deputy Commander and Command Pilot of Civil Air Patrol Squadron 34; Member, Humboldt County Forestry Advisory Committee; Member, Board of Directors, United Crusade; Member, Board of Directors of the Lutheran Home for the Aging; Vice President, Charles Thurman Aviation Education Memorial Foundation; Member, Aircraft Owners and Pilots Association; Member, Congressional Secretaries' Club; Member, The Press Club of San Francisco, and the Marine Memorial Club; Member, Masonic Lodge.

MERVIN W. AMERINE, Member

Member, California Aeronautics Board, and former Chairman of the Board; active in agricultural and aviation businesses; turkey breeder with international sales; cattle raising; airport operations and aircraft maintenance experience; repair and inspection; fuel-servicing, and related activities; operated a fleet of DC-3 aircraft throughout the United States, Canada, and Mexico; WW II Army Air Force Pilot, and Korean War USAF Pilot; Member, Stanislaus County Taxpayers Association, Oakdale Chamber of Commerce, and Advisory Committee for the U.S. Chamber of Commerce.

FRAN BERA, Member

Pilot examiner for Aztec Aircraft in Long Beach; Active member of the Ninety-Nines.

ROBERT BLODGETT, Member

Senior Editor for Flying Magazine; Long-time pilot, instructor, and author.

CHARLES M. BUSSEY, Member

Lt. Colonel, U. S. Army (Retired); Member, California Aerospace Education Advisory Committee for the Superintendent of Public Instruction.

VERN CARTWRIGHT, Member

President, Cartwright Aerial Surveys, Inc.; Member, California Aerospace Education Advisory Committee for the Superintendent of Public Instruction.

HOWARD M. CRITCHELL, Member

WW II U. S. Army Air Force Pilot and Operations Officer; Communications Officer; Two years with the Civil Aeronautics Administration in Air Route Traffic Control (this was the forerunner of the present FAA); Captain with Western Air Lines; President, Bates Foundation for Aeronautical Education; Airline Transport Pilot rated; Flight and Ground Instructor; Rated in airplane, single and multi-engines, and single engine seaplanes; Commercial Glider Pilot; more than 20,000 hours of flight time.

RAY DARBY, Member

Superintendent of Schools for Shasta County; B.S. in Business Administration, University of Southern California; M.S. from Chico State College; Taught in the Redding Elementary Schools from 1949 through 1951, Chairman of the Curriculum and Publications Committee of the County Superintendents' Association; Member, Aerospace Education Advisory Committee for the Superintendent of Public Instruction; Member, CASA Ethics and Professional Relations Committee; Secretary, Region I, Association of California School Administrators; President, Board of Far Northern Coordinating Council on Mental Retardation; President, Redding Kiwanis.

DON DOWNIE, Member

West Coast Representative for the Aircraft Owners and Pilots Association; Free-lance writer for many aviation periodicals; Author of many air travel and aircraft evaluation articles.

ROBERT M. EBERHARDT, Member

President, Bank of Stockton; Graduate of New Mexico Military Institute and the University of the Pacific; State Bank Examiner 1952-1956; Member, Board of Regents, University of the Pacific; Member, Board of Trustees, San Joaquin County Pioneer Museum; Commissioner, Port of Stockton; Member, Aviation Education Advisory Committee to the Superintendent of Public Instruction; Member, Greater Stockton Chamber of Commerce; State representative to the National Association of Supervisors of State Banks.

LAURETTA FOY, Member

Chief pilot for Southland Helicopters Division of Hughes Tool Company; More than 10,000 hours flight time in aircraft and helicopters; Graduate of Occidental College; Instructor in the Civil Pilot Training (CPT) Program during World War II; Flight instructor for Piper Aircraft Corporation; World War II WAF; Production line test pilot and check pilot for North American Aviation on the Navion aircraft; Former stock-brokerage employee 1952-61; Member, FAA Women's Advisory Committee on Aviation from 1967 through 1970; Chairman of that committee for 1969 and 1970; Member, Board of Directors, Professional Helicopter Pilots' Association; Member, Ninety-Nines; Member, President Nixon's Aviation Advisory Commission; Vice President of the Whirly-Girls.

PHILIP C. GARLINGTON, Member

A.B., M.A.; Taught at Del Norte County High School, Hanford Union High School, and the University of the Pacific; Faculty member, Stockton College in 1945; Dean of Men from 1948-51; WW II Shipboard Communications Officer; Ten years as Director of Instruction, College of San Mateo; Commander, Naval Reserve; President, Skyline College in San Bruno; Former chairman, California Junior College Association Committee on Curriculum and Instruction; Member of a Federal committee on accreditation of service experience; Member of a State committee on articulation.

MARVIN HAYS, M.D., Member

B.S. 1942, M.D. 1945, University of Oklahoma; Residency and Graduate training in Orthopedic Surgery; Certified, American Board of Orthopedic Surgery; U. S. Army service in the Medical Corps, with specialty in psychiatry; Private Pilot, Single and Multi-Engine, land, aircraft; Instrument rating; Member, Flying Physicians; Active staff member at St. Joseph's Hospital and General Hospital in Eureka; Consulting staff member for a number of other hospitals; Member, Civil Aviation Medical Association, and Aerospace Medical Association; Major, Medical Officer, and Mission Pilot for the Civil Air Patrol; Member, Advisory Committee and Review Board for Aeronautics, College of the Redwoods; Member, California Medical Association Committee on Disaster Medical Care; Member, California Council on Aviation Safety; Guest lecturer, at the College of the Redwoods; Member, Air Force Association; Member, Aircraft Owners and Pilots Association; President, National Flying Physicians' Association.

WILLIAM D. HECHT, Member

Retired Educational Representative for United Airlines Engineering and Maintenance Division in San Francisco; Active in the California Aerospace Education Association; Member, California Aerospace Education Advisory Committee to the Superintendent of Public Instruction.

PEGGY G. HEREFORD, Member

Director of Public Relations, City of Los Angeles, Department of Airports since 1950; Former West Coast Editor for American Aviation; Director, News Bureau for Western Air Lines from 1939-1942; Instructor in Air Transportation at Woodbury College in Los Angeles; Co-author of an airline history – "The Flying Years," and a contributor to the college textbook "Air Transportation and Commerce"; Member, Board of Directors, Women's Division, Los Angeles Chamber of Commerce; Member, Board of Directors, Travelers Aid Society, Los Angeles area; Member, Aviation and Space Writers' Association; Member, Airport Operators Council International, Public Relations Committee; Recipient of several national and international awards.

NORMAN JACO, Member

Superintendent, Westside Elementary School District, Five Points, California.

EUGENE KROPF, Member

Public Affairs Officer, FAA Western Region; World War II Instructor for the Army Air Corps Primary Pilot Training Program; B.S., Parks College; Learned to fly in 1927; Former employe, American Airlines and TWA; Instructor at Parks College; Director, Aeronautical Administration Department, Saint Louis University; Assistant Professor; Assistant Dean of the College in 1950; began career with the FAA's forerunner, the Civil Aeronautics Administration in 1957; Member, Aviation/Space Writers' Association; Member, International Society of Aviation Writers; Member, National Aeronautics Association; Member, National Aerospace Education Association and the California Aerospace Education Association;

Member OX-5 Club of America; Member, Air Force Association; Member, Stearman Alumnus Club; Member, National Aerospace Educational Advisory Committee of the Civil Air Patrol; Member, Advisory Board of the National Intercollegiate Flying Association, and serves on the aviation advisory committees for a number of colleges in the Western United States; Recipient of a number of awards, including the USAF Association's Award for "Outstanding Achievement in the Field of Aerospace Education," the FAA's Meritorious Service Award for outstanding service in the field of public relations, and for his work with teachers and school administrators in organizing and presenting aerospace workshops.

LAWSON MILLER, Member

Educated at Ohio State University, Akron University, University of California at Santa Barbara and at Los Angeles; University of Southern California and Claremont Graduate School; Holder of credentials, including life diploma in Education, State of California; Industrial Education; General Metal Shop; Print Shop; Wood Shop; Auto Mechanics; Drafting, Plumbing, Crafts and Ceramics; General Secondary Credential; Secondary Administrative Credential; Special Secondary Credential; Pupil Personnel Credential; Psychology Credential; Now retired after 33 years with the Los Angeles City Schools; Coordinator of Work Experience Education; Vocational Educational Education Counselor; Consultant, Research and Evaluation Section; Member, Examination Board, Los Angeles Police Department; Pilot, single-engine aircraft, land, with 3,100 hours flying time; Member, OX-5 Club; Feature writer and syndicated columnist on aviation; National President, Flying Educators, Inc.; and Colonel in the Confederate Air Corps.

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EUGENE J. PORTUGAL, Task Force Member

B.S., M.A., EdD, University of California, Berkeley; Headed Civilian Pilot Training Program at Modoc Union High School in Alturas, 1939-1941 and at Santa Rosa Junior College 1941-42; WW II Naval service as a Lt. Commander, Navigator and Executive Officer; 16 years with complete charge of the aviation programs at Santa Rosa Junior College; 5 years Chairman, Aviation Education Committee for the California Junior College Association; Charter member, California Aerospace Education Association; President, Northern California Junior College Association 1957-58; Founding president, College of the Redwoods, Eureka, California, 1964 to present.

CLETE ROBERTS, Task Force Member

President, U. S. Television – Newsfilm, Incorporated.

DANIEL G. WALKER, Task Force Member

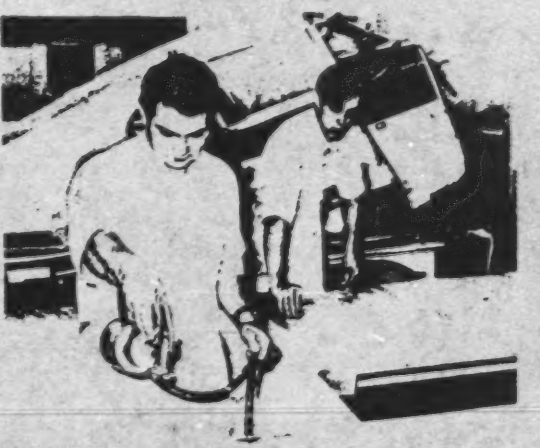
Superintendent-President, Yuba Community College District; Former president, Cypress College in Orange County from 1966-70; B.A. in History and English, University of Corpus Christi, Texas; M.A. in History and English, Southwest Texas State College; Ed.D., in Secondary and Higher Curriculum, University of Southern California; Taught in McAllen (Texas) High School, Templeton High School, California, Central High School in El Centro, Imperial Valley College in El Centro; San Diego State College; Merced College; Author of "The Community College, A Twentieth Century College," 1965; "The Disappearing Campus," The Junior College Journal; and "The House Plan at Cypress," in the same publication; Member, Committee on International Education, American Association of Junior Colleges; California Association of Secondary School Administrators; Committee on Instructor Exchanges of the California Junior College Association; California Teachers' Association; and the Board of Directors, Cypress Chamber of Commerce 1967-70. Dr. Walker received his early education in elementary schools in Bulgaria and Czechoslovakia, at Taunton Preparatory School in England; at Eltham College in London, England.

WILLIAM R. WILSON, Task Force Member

Vice President, Lockheed Aircraft Corporation, Burbank, California.

DAVE ZEBO, Task Force Member

Nineteen years experience as a member of the California Highway Patrol; sixteen years as Aviation Director for Humboldt County; WW II service with the U. S. Marine Corps; Commercial Pilot, single and multi-engine aircraft; Instrument rated; Past president, California Association of Airport Executives; worked with U. S. Forest Service in aerial drops; and active in Search and Rescue.



Appendix 2

Governor's Aerospace-Aviation Education Task Force Committees

Elementary and Junior High Schools

Chairman: Dr. Myrl C. Rupel

Members:

Mervin W. Amerine	Don Downie
Miss Fran Bera	Robert M. Eberhardt
Lt. Col. Charles M. Bussey	Mrs. Peggy G. Hereford
Vern Cartwright	Norman Jace

High Schools and Community (Junior) Colleges

Chairman: Miss Harriett E. Porch*

Members:

J. Floyd Andrews	Lawson Miller*
Robert Blodget	Clete Roberts
Philip C. Garlington	Daniel G. Walker
Elmer Haskin	William R. Wilson
Eugene Kropf	Dave Zebo

Colleges, Universities, and Private Schools

Chairman: Thomas E. Leonard

Members:

Howard M. Critchell	Dr. Marvin Hays
Joseph R. Crotti	Mrs. Peggy G. Hereford
Ray Darby	Eugene Kropf
Mrs. Lauretta Foy	Dr. Eugene J. Portugal

Industry — Professional

Chairman: William D. (Bill) Hecht

Members:

Mervin W. Amerine	Don Downie
J. Floyd Andrews	Mrs. Lauretta Foy
Miss Fran Bera	Dr. Marvin Hays
Robert Blodget	Mrs. Peggy G. Hereford
Vern Cartwright	Eugene Kropf
Joseph R. Crotti	Miss Harriett Porch
William R. Wilson	Clete Roberts

*NOTE: Miss Porch served as committee chairman for most of the Task Force activity, and following her resignation as committee chairman, continued to serve as a Task Force Member. Mr. Lawson Miller succeeded Miss Porch as the committee chairman.

Appendix 3

Advisors to the Task Force

During the early months of the Task Force activities, and at the request of Governor Reagan, a number of advisors were designated by the University of California, the State Colleges, the Community Colleges, and the Department of Education. The Task Force acknowledges the contributions of these advisors, and is grateful for their assistance. Additionally, a number of other ladies and gentlemen cooperated with the Task Force in an advisory capacity. The advisors are listed below:

President Charles J. Hitch of the University of California designated

Professor E. V. Laitone, of the Division of Aeronautical Sciences, University of California, Berkeley Campus

and

Professor William Kaula, Vice Chairman, Planetary and Space Sciences Department, University of California, Los Angeles

Chancellor Sydney Brossman of the California Community Colleges designated

Mr. Leland P. Baldwin, Assistant Chancellor for Vocational Education

and

Mr. Elmer R. Wirta, Consultant in Industrial Education

Chancellor Glenn S. Dumke of the California State Colleges designated

Dr. John J. Baird, Associate Dean, Division of Academic Planning in the Chancellor's Office

and

Dr. William H. Shutts, of the School of Engineering, San Diego State College

Dr. Max Rafferty of the Department of Education, and Superintendent of Public Instruction, designated

Wesley P. Smith, Director, Vocational Education

and

W. Earl Sams, Consultant, Bureau of Elementary and Secondary Education

Other advisors and consultants included the following:

Mr. Stewart Angle, Chairman, Aeronautics Department of Mount San Antonio College

Dr. Marian Wagstaff, Department of Education, California State College, Los Angeles

Mr. Ted G. Misenhimer, Aeroscience Instructor, Redondo Union High School

Mr. Robert J. Mullen, Director of Special Programs, Richmond School District

Rev. Norman W. Walters, Junior ROTC Instructor, Delano High School

Mr. Mike Donahoe, Educational Programs Director in NASA's Pasadena office (subsequently transferred to Moffett NAS)

Mr. Al Clark, Administrative Consultant, Bureau of Program Planning and Development, Department of Education

Mr. Richard G. Dougherty, Aviation Consultant, California Department of Aeronautics, who prepared this report.

The Task Force is especially indebted to Mr. Dougherty for his untiring effort in coordinating the efforts of the various committees, and for his preparation of the Task Force Report, reflecting the accomplishments and recommendations of the Task Force.

Special acknowledgement is also made to the Douglas Aircraft Company of McDonnell Douglas Corporation who made available the personnel and resources of Douglas Aircraft Company for the design, layout, art work, final editing, typographical composition, and the first printing of this report.

Executive Department

State of California

PROCLAMATION

WHEREAS, The successful flight of Apollo 11 has kindled the spirit and captured the imagination of mankind as have few events in history, and was a demonstration of man's ability to soar beyond the limitations of earth and to achieve the apparently impossible; and

WHEREAS, Its success goes far beyond the beginning of space exploration and proves beyond doubt that in a creative society we can do anything we truly commit ourselves to do; and

WHEREAS, In January of this year I appointed the Aerospace-Aviation Education Task Force, which is chaired by Congressman Don Clausen, to study and submit recommendations on California's educational program in the field of aerospace and aviation,

NOW, THEREFORE, I, RONALD REAGAN, GOVERNOR OF CALIFORNIA, do hereby proclaim the year beginning with the opening of our schools in September, 1969, as AEROSPACE-AVIATION EDUCATION YEAR; and urge all educators in the State of California, at every scholastic level, and in every field of study, to: (1) enrich their own courses with aerospace-aviation material, (2) inform their students of the depth and breadth of career opportunities in aerospace-aviation—already the largest non-agricultural industry in California, (3) develop insights into the vital social factors involving aerospace and aviation with the lives of all Californians, (4) seize every opportunity to translate the excitement of our success in the moon landing to optimism for finding solutions to our pressing problems on earth and (5) prove again that cooperation is the best weapon against confrontation.

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IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 19th day of September, One Thousand Nine Hundred Sixty Nine.

Ronald Reagan

Governor

ATTEST: Frances McGrath

Secretary of State

by Thelma E. Smith

Deputy Secretary of State

Seal in California Office of State Printing

Appendix 4

Text of Governor Reagan's Remarks to the Aerospace-Aviation Education Task Force June 16, 1969

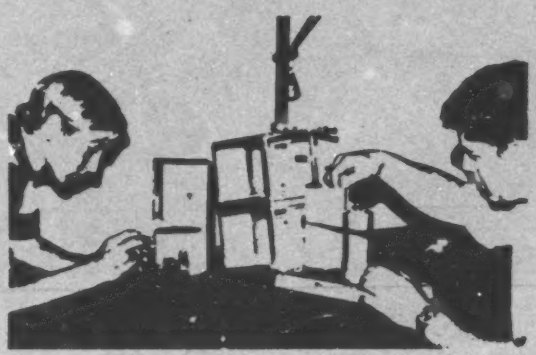
Good afternoon, Ladies and Gentlemen of our Task Force for Aerospace-Aviation Education. I want to personally thank each of you for taking time out of your busy schedules to meet with me here today, and to participate willingly as members of the Task Force. The press of other duties has prevented our meeting together earlier, but I understand that the organizational meeting at San Jose went well. I am deeply interested in education in all of its aspects, and it is my earnest conviction that aerospace-aviation has a place of prominence in our educational system. Your presence here today attests to a similar conviction on your part. I commend you for your public spirit and your progressive outlook on life.

This administration is wholly in accord with the aims and objectives of the Task Force. The complexities of this air age demand that our educators bend their efforts toward adapting space and aviation concepts to the task of furnishing our young people a sound basis of understanding of the world around them. As I see it, the function of an educational institution – or educational system – is to produce citizens who are totally aware of life, and who are capable of assuming productive and meaningful roles in the modern community. In the full realization that aerospace-aviation is the largest nonagrarian user of manpower, it becomes abundantly clear that adequate preparation is required if our young people are to take on their responsibilities when they leave our schools. We need competent citizens in the fields of management, administration, operations and maintenance. We need the engineers, the designers, the transportation specialists and above all we need the generalists – that is – those who have a degree of familiarity with many aspects of aerospace-aviation, and who can blend aviation into an integrated system to accommodate movement. For movement is the essence of modern communications and the exchange of ideas.

While a number of our schools and colleges now offer aviation courses – more than 61 colleges and 79 high schools – we still are not reaching the majority of our students. We are seeking ways of broadening the opportunities for aerospace-aviation education to reach increasing numbers of our young people. Not just any course, however, will satisfy the need. What is required is quality in education, delivered by those competent to impart the knowledge – and that is one of the areas in which we are seeking help from this Task Force. Curriculum content, source materials, and instructor qualifications are vital considerations if our aerospace-aviation education efforts are to bear fruit.

Working carefully with Congressman Clausen, a most persuasive and astute gentleman, we have chosen you as members of the Task Force because of your expertise and background in aviation. I am going to rely heavily on the advice and assistance you ladies and gentlemen come up with during the course of your work on this Task Force. I understand some committees are already organized and working on the various aspects of the situation, and I want to assure you that you can count on my support. Aerospace-aviation education will occupy a prominent position in the creative society so necessary in this modern air age, and I am deeply gratified by your efforts in this endeavor.

The school administrators, faculty members and advisors of our schools and colleges have achieved varying degrees of success in the educational programs they have fostered. We have noted with interest that some of our smaller communities have been able to generate greater interest in aviation education than some of our larger cities. This applies to school boards, school officials, students, and their parents. Some of the schools have full-blown programs of many years duration, and others are just getting started. It would not be possible to publicly recognize every one of these programs, and so we have singled out just a few to be honored here today on the basis of the excellence of their aviation education programs. From the more than 140 high schools and colleges, we have selected eleven. These eleven are typical, and their honor should reflect on the others who were not selected this time. On behalf of the Task Force, I wish to publicly commend the eleven institutions for their continuing efforts in this vital field of education, and to cite them as proper examples for others to follow in establishing similar aerospace-aviation education programs. It was difficult to do so, but we narrowed the field of 140 down to 6 colleges and 5 high schools . . .



Appendix 5

Excerpts from Address by Congressman Don H. Clausen to the Aerospace-Education Task Force, Sacramento, California, June 16, 1969

Aviation and air transportation now play, and will continue to play, a dominant role in the movement of goods, services, and people, throughout the State of California, the United States, and indeed, throughout the entire Western Hemisphere. As the jumbo jets, the supersonic transport, and other fixed and rotary-wing aircraft, go into commercial use, worldwide air marketing programs will expand tremendously. In addition, there is growing interest in the future uses of STOL (Short TakeOff and Landing) and VSTOL (Vertical Short TakeOff and Landing) aircraft to supplement the present air-carrier fleet. And business aviation and general aviation usage is expanding at fantastic rates of growth.

This, basically, is the direction in which we are moving when aerospace-aviation programs and objectives are viewed collectively. But what are the more immediate benefits and advantages to be gained from a dynamic and future-oriented aerospace-aviation education program in the public schools of California? What specifically is in it for the young people? – the students of our State?

Over the years, successful aviation education programs have repeatedly demonstrated that they are, in fact, significant motivating factors in stimulating poor students to become honor students, and inducing potential dropouts to remain in school and complete their education.

Therefore, and based on years of personal experience, I am convinced that aerospace-aviation education is not only an effective and viable "anti-dropout tool," but a highly motivating force that will provide the kind of challenge that many young people desperately need early in life, especially during their school years.

I have proven to myself, during my 23 years of "experimenting" with this program of aerospace-aviation education, that I can capture the imagination of any student from any home environment – by exposing him or her to the challenge of flight – be it in the classroom, the stationary flight simulator, or actual flight in an aircraft.

The cost? This is something that we must all be concerned about! Let me state categorically, however, that the implementation and insertion of this type program into or associated with the established curriculum of our schools, will actually save money, when considered in conjunction with our total public sector budgets. Some skeptics might say, "How can you, Congressman Clausen, make this kind of statement?" Here again, permit me to relate some of my personal experiences.

During my service as a member of the Board of Supervisors of Del Norte County for seven years, I reviewed, perused, and carefully scrutinized the annual budget of the various department heads. Among them, of course, were the budgets of the Judge of the Superior Court, the District Attorney's office, the Probation Office, the Juvenile Hall, the Sheriff, the "Bar-O-Boys Rehabilitation Camp," the Welfare Office, etc. After observing the large percentage of dollars of the overall budget requested and required to finance the functions of these offices, I decided to conduct research in the specific areas of costs to our taxpayers for juvenile delinquency and probation problems, as well as minor and major criminal problems.

The cost factors revealed were, to say the least, shocking, and they prompted me to relate them to the high school principal, the Judge, the Superintendent of Schools, and committee members of investigating grand juries. I found that each boy or girl committed to the Youth Authority, or the Department of Corrections, costs the taxpayers approximately $13,000, and those individuals committed to penal institutions as convicted criminals, cost an average of $35,000. My candid comment to local officials, at that time was, "Save one boy from the Youth Authority, and you've bought one airplane or simulator; save one boy or girl from a life of crime and you've paid for the entire program."

Once exposed to these economic facts of life, these key community leaders and many previously skeptical parents could readily see the reasonableness and the rationale of my suggestion to continue and broaden the exposure to the challenging program of aviation education in Del Norte High School. Therefore, I submit we can better invest our tax dollars in the kind of innovative programs that I like to refer to as "preventive maintenance." Believe me, I can refer you to many parents who are willing to testify to the success of our efforts. Once our program was underway, an Assembly Committee on Education held hearings in Crescent City, California, for the purpose of evaluating our results. The testimony of some of these parents and students is available in the public record.

Mine, of course, is but one experience. There are thousands of other examples, and one that bears repeating took place in the Richmond Unified School District. Here, a "flight-experience program" was tested for students from the ghetto areas, and this experiment dramatically demonstrated and proved

the motivational potential of the kind of program that will broaden their perspective through exposure to something new and challenging.

From this experience, it was determined that learning performance was significantly improved for those students in the program who had been previously classified as disciplinary problems. Thus, the value of this particular program was recognized, not only by the students and the school authorities, but more noteworthy, by the students' parents.

Thus, we see that the heart of the problem lies not so much in not having adequate or suitable aviation education programs – but rather, in the fact that we just don't have enough of these logical and constructive programs in existence. We know, for instance, that 46 college and 77 high schools in California have some type of aviation education program, but from these figures, it is obvious that there are far too many areas where such programs just don't exist at all. This, then, is the challenge and the opportunity. The time has come for all Californians, all Americans, and in particular, our educational institutions to broaden their perspective to eliminate "tunnel vision" – to seek broader horizons in this, our jet and space age.

The challenge of change in our everyday living demands that we commit ourselves to this worthy task.

We *can*, as dedicated and creative people, recapture the American dream – through aviation.

We *can* rekindle the spark of hope and faith in America – through aviation.

We *can* stimulate, motivate, and accelerate the learning process – through aviation.

We *can* broaden the horizons – we *can* broaden the perspective of individuals – through aviation.

We *can* open up "opportunities unlimited" for this generation and for future generations – through aviation.

We *can* "Revitalize rural America" and "Building Countryside, USA" – through aviation.

We *can* provide relief from the over-crowded pressure cookers – the high-rise ghettos – the concrete jungles of urban metropolitan areas – through aviation.

We *can* better coordinate the movement of people, goods, and services – through aviation.

We *can* improve the environment for future living – through aviation.

Governor Reagan, we, the members of your Aerospace-Aviation Education Task Force, are deeply grateful to you for launching this timely, space-age educational proposal, just one day before the arrival of the Apollo 10 astronauts – Stafford, Young, and Cernan – here in California.

In the months ahead, we hope to have before you the best recommendations California's aviation brain power can formulate. Like you, we want to make the best better.

Appendix 6

Report to Aerospace-Aviation Education Task Force by Marvin B. Hays, M.D.

In accordance with directions from Congressman Don Clausen, information has been gathered from numerous sources relating to medicine, and medical topics, in the education program of Aerospace, and Aviation, within the school system, State of California. No attempt is made to formulate an outline for curriculum use.

This Summary is divided into categories, according to the level of education, and to the relationship of the medical subjects to a particular educational program. These categories are as follows:

1. The preliminary Aerospace-Aviation training activities, as found in the Junior High, and High School levels.
2. The Aerospace-Aviation training programs relating particularly to air crews and at the Junior College, and College level.
3. Aerospace-Aviation medical subjects relating to the Medical school curriculum.
4. Post-graduate training program for Doctors of Medicine, leading to a Master's Degree and qualification as an Aerospace Medical Specialist.

Category I

MEDICAL SUBJECTS WITHIN THE JUNIOR HIGH, AND HIGH SCHOOL LEVEL OF TEACHING OF AEROSPACE AND AVIATION ACTIVITIES

For a number of years aviation has been utilized as the catalyst to stimulate interest of the Junior High School student, and, consequently, to change him from a problem student to an achieving student. Reports of success of these programs are readily available. It is obvious that a youngster in the 7th, or 8th, grade level, cannot satisfactorily participate in an aviation program of this type if he is an habitual user of drugs. The experience of enforcement agencies indicate that the use of marijuana is common in the 7th, and 8th, grade levels, and that there is a growing use of alcohol, speed, barbituates, narcotics, and other more noxious drugs.

It is recommended that at the Junior High, and High School levels the instructors be acutely aware of this subject of drugs, as relates to their aviation

instruction, but that any direct reference, particularly to an individual student, may require the added services of an expert. The majority of the students should respond to this "lay off drugs" part of the course as readily as to the general aspects of the effort.

Category II

JUNIOR COLLEGE AND COLLEGIATE LEVEL

In the college level of Aviation education, the primary interest has been with the training of air crews. The largest groups at the present seem to be pilot training programs, but there is increasing interest in training of airline administrators, airline hostesses, and other members of the air transportation industry.

The training program for the pilot is of particular interest as relates to medical subjects. This has been recognized by the Federal Aviation Administration to the point that they now include several questions on medical subjects on the written examination for the advanced ratings. The student pilot obviously will make a serious effort to qualify himself, and to obtain his license, and ratings. If he has foreknowledge that medical subjects are a part of the examinations, he will make an effort to be reasonably informed in the subject, and should have the opportunity of adequate instruction to assist him in getting proper information. The real purpose, of course, is to have the pilot, and any member of a flight crew, knowledgeable to a degree that they can apply this information to the safe conduct of their aviation activities. Many training programs at the college level do include lectures relating to hypoxia, vertigo, and drug reactions. A survey of 81 junior colleges in California indicates that this part of the training is probably inadequate, and should be revised. It is recommended that the schools dealing with this type of training program be encouraged to formulate an adequate curriculum. It may be advisable that the lectures dealing with medical subjects be presented by a physician who is knowledgeable in the field of aviation medicine. It is suggested that the knowledgeable physician, who is also a rated pilot, will have a better impact on the student group, than the non-pilot. The Federal Aviation Administration should be able to help the colleges locate qualified and interested physicians to serve as guest lecturers.

Category III

MEDICAL SCHOOL LEVEL

It has been reported by F.A.A. that there are four Schools of Medicine which include aviation subjects as electives within their curriculum. These schools are Ohio State University, School of Medicine, Columbus, Ohio; University of Texas, Medical Branch, Galveston, Texas; University of Oklahoma, School of Medicine, Oklahoma City, Oklahoma; Harvard School of Medicine, Cambridge, Massachusetts. My investigation has shown that in the State of California there are elective courses available at the University of California, School of Medicine, San Diego; University of California, School of Medicine, Los Angeles; and at Stanford University, School of Medicine, Stanford, California. These schools do not have lectures in Aerospace-Aviation Medicine as a part of the regular courses, but only on an elective basis.

Aerospace, and Aviation, activities in the United States have reached a magnitude, at this time, which is worthy of review. The figures for 1968 indicate that approximately 100 million people were passengers of the air carriers for this year. It is estimated that an equal number of passengers were carried by the private sector of aviation. It is forecast that during the next five years this number will more than double. Obviously, many of the people listed as passengers have been counted several times in any calendar year, so that the estimate that 75 percent of the population that have been air transported, is probably more nearly 20 to 25 percent of the population when we get to the actual involvement. In 1969, there were approximately 600,000 licensed pilots in the United States. If we include air traffic controllers, airport, and air-service, personnel, the people in aircraft, and aerospace, industries, it becomes obvious that a very large number of people are involved in these activities in the United States, and that it is reasonable that the medical student of today be made aware of the special problems having to do with Aerospace and Aviation. The practicing physicians within the State should be able to advise patients as to problems which may be encountered, or should be considered, when dealing with air transportation. He should be able to advise his patients who are members of a flight crew regarding their personal health, the use of various drugs and medications, and the effects that these might have on performance. These physicians should be knowledgeable in the basic problems of Aerospace and Aviation Medicine, and capable of applying their general medical knowledge to this field.

In order to achieve this goal, it is advisable that each Medical School include Aerospace-Aviation tropics as a portion of the regular curriculum. The probable choice for such exposure would be in the third, or fourth, year of training. The lecture should be delivered by an individual knowledgeable in Aerospace-Aviation Medicine, and probably would be related to the established courses in Public Health, or Preventive Medicine. It would be up to each school to

implement such a lecture, or lectures, to the best advantage of the school, and of the students involved.

It is also suggested that the Schools of Medicine within the State of California be encouraged to continue to elective courses dealing with Aerospace and Aviation Medicine.

Category IV

MEDICAL SCHOOL POST-GRADUATE LEVEL

Post-graduate training in Aerospace and Aviation Medicine represents a very limited educational endeavor within the United States at the present time. The program falls within the "residency" classification of post-graduate training, and, as of this date, there are no such programs available within the State of California.

Aerospace Medicine is a recognized specialty in the United States. The first civilian residencies for this type of program were set up at Ohio State University in 1955, and the second was established at the University of Oklahoma in June, 1967. Most physicians who have specialized in Aerospace and Aviation Medicine are graduates of the various military training programs. It is interesting to note that graduates of military training programs are not suitable for civilian Aerospace medical activities without additional training. It is estimated that there will be a need for approximately 150 Doctors of Medicine who are qualified as specialists in Aerospace Medicine during the next five years. At the present rate of specialization training, it would appear that less than one-third of this number of physicians will be available during this five year period. In that California is a center of Aerospace and Aviation industry and activity, and in that the University of California at Los Angeles, School of Medicine, has been active in Aviation and Aerospace Medicine, and does have readily available the physical capability, and the personnel, to meet the needs of a post-graduate course, it is reasonable at this time to consider the establishing of a residency program at the School of Medicine, U.C.L.A. This residency program should lead to a Master's Degree in Aviation Medicine and to qualify the resident to become a certified specialist in Aerospace Medicine. The details of such a residency program can be obtained from those now existing at Ohio State and the University of Oklahoma.

In a few years, consideration should also be given to initiating an additional residency program in Northern California.

Appendix to Report by Dr. M. B. Hays

CATEGORY I

The opinions evolved in the Category I report are primarily based upon a review of reports of experiments and activities in the Junior High level, and in Southern California, where aviation has been utilized to stimulate these students to better achievement and social conduct. In addition, personal communication has been received from the following:

Congressman Don H. Clausen, Chairman, Aerospace-Aviation Education Task Force.

Daniel A. Grabski, M. D., Flying Physician Association; State Department of Mental Health, Sacramento, California.

Mr. Norman Jaco, Member, Aerospace-Aviation Education Task Force; Superintendent, Westside Elementary School District, P. O. Box 398, Five Points, California, 93624.

Mr. Lawson Miller, Member, Aerospace-Aviation Education Task Force; President, Flying Educators, Inc., P. O. Box 3333, Van Nuys, California, 91407.

Additional information has been received from the Federal Aviation Administration, Department of Aviation Education, Washington, D. C.

CATEGORY II

The information relating to suggestions in Category II, dealing with medical subjects in flight crew and aviation personnel at the Junior College, College level, has been obtained through a review of various aviation publications, and personal communications with individuals in the field of Aerospace and Aviation Education, and with various organizations interested in, and related to, Aviation and Aerospace Education. Individuals included a number of members of the Aerospace-Aviation Education Task Force, and also the following:

Dr. Charles E. Billings, Director, Aviation Medicine Research Laboratory, Ohio State University, Columbus, Ohio.

Wayne P. Chesbro, M. D., Chairman of the California Medical Association, Committee on Disaster, 2300 Durant Avenue, Berkeley, California.

George A. Jutila, M. D., Lecturer-Aviation Program, College of the Redwoods, Eureka, California.

Mr. Thomas E. Leonard, Department of Aeronautics, San Jose State College, San Jose,

California, and member of Aerospace-Aviation Education Task Force.

Mr. Bernal Lewis, A.L.P.A., Pan-American Airways, 20205 Skyline Drive, Woodside, California, 94062.

Mr. H. Gene Little, Vice President, Education and Training, World Airways, Inc., Oakland International Airport, Oakland, California, and member, Aerospace-Aviation Education Task Force.

Dr. Eugene Portugal, President, College of the Redwoods, Eureka, California.

Mr. T. J. Royall, Manager-Training, Three-Engine Jet, Eastern Airlines, Miami, Florida.

Mr. Donald R. Sellers, Director, Aviation Education, Jeppesen, 8025 East 40th Avenue, Denver, Colorado, 80207.

P. V. Siegel, M. D., Federal Air Surgeon, Federal Aviation Administration, Washington, D. C.

Charles M. Starr, M. D., Flight Surgeon, 10659 Riverside Drive, North Hollywood, California, 91602.

Mr. Mervin K. Strickler, Jr., Special Assistant for Aviation Education, Department of Transportation, Federal Aviation Administration, Washington, D. C.

Mr. Frank E. Truesdale, Assistant Dean, Lincoln College, Northeastern University, Boston, Massachusetts.

Robert L. Wick, Jr., M. D., Ohio State University, Department of Preventive Medicine, Aviation Medical Research Laboratory, Columbus, Ohio.

CATEGORY III

The opinion and information as presented relating to Aviation Medical subjects in Medical Schools was derived from communications with various members of the Aerospace-Aviation Education Task Force, and by communication with the following individuals and their organizations.

Dr. John R. Beljan, Associate Professor of Surgery, Bioastronautics Laboratory, University of California, Davis, California.

Dr. Warren L. Bostick, California College of Medicine, University of California, Irvine, California.

Dr. Stuart C. Cullen, Dean, School of Medicine, University of California, San Francisco, California.

Dr. J. Robert Dille, Federal Aviation Administration, Oklahoma City, Oklahoma.

Dr. Vincent M. Downey, Department of Preventive Medicine, Stanford University, School of Medicine, Stanford, California.

Dr. G. Gordon Hadley, Associate Dean, Loma Linda University, School of Medicine, Loma Linda, California.

Mr. James L. Harris, Chief, Aero-Medical Education Branch, Federal Aviation Administration, Oklahoma City, Oklahoma.

Dr. L. G. Lederer, Medical Director, American Airlines.

Dr. Sherman M. Mellinkoff, University of California, School of Medicine at Los Angeles, California.

Frank K. Raymond, M. D., Regional Flight Surgeon, Federal Aviation Administration, Los Angeles, California.

P. V. Siegel, M. D., Federal Air Surgeon, Federal Aviation Administration, Washington, D. C.

Dr. Harold J. Simon, Associate Dean for Education and Student Affairs, University of California, San Diego, California.

Colonel S. O. Smelsey, U. S. Air Force, Medical Corps., Chief, Life Sciences Group, Norton Air Force Base, San Bernardino, California.

Dr. Richard F. Timmer, Associate Dean of Medicine, University of Texas, Medical Branch, Galveston, Texas.

Dr. John L. Wilson, Associate Dean, Stanford University Medical Center, Stanford, California.

CATEGORY IV

Dr. J. Robert Dille, Federal Aviation Administration, Oklahoma City, Oklahoma.

Mr. James L. Harris, Chief, Aero-Medical Education Branch, Federal Aviation Administration, Oklahoma City, Oklahoma.

Stanley R. Mohler, M. D., Chief, Aero-Medical Applications Division, Office of Aviation Medicine, Department of Transportation, Federal Aviation Administration, Washington, D. C.

Dr. Carl A. Nau, University of Oklahoma, Medical Center, School of Health, Oklahoma City, Oklahoma.

Brig. Gen. Reinartz, U. S. Air Force, Retired, Carmel Valley, California. (Deceased)

Appendix 7

Report by Dr. Daniel G. Walker to the Task Force and to the California Junior College Association

Aerospace-aviation education is growing rapidly among the Community Colleges of the State of California. Other reports have documented the growth of these programs in aerospace-aviation education and related fields, such as flight training, aircraft mechanical training (Airframe and Powerplant), aero business, airport management, air traffic management and control, stewardess-hostess programs, and others. High schools below, and State Colleges above the

Community College level have pioneered in this eminently important area, with some, but not enough, attempts at articulation and cooperative planning; other courses and programs have been planned and developed independently with little articulation and liaison with other existing programs.

Due to various problems, the rapidity of the development of the aviation programs, the multiplicity of facets of the field, the bewildering pace of the technological growth of the field, the lack of any comprehensive national, statewide, or even regional planning of aviation programs, and the usual problems of staffing and funding, the aviation programs of the community colleges (and other branches of education, no doubt) do have some serious problems, problems that could be remedied by voluntary action, by legislation, and by a definite state commitment in the form of legal, administrative and financial assistance. Specifically, the community colleges have been encouraged many times to enter this important field, have been anxious to serve this great area of our economy, but nevertheless have found implicit difficulties in several areas that have stood as roadblocks to sustained action. These roadblocks encountered differ from one part of the state to another, as different county counsel rulings have helped some programs and hindered others. What is needed is clear-cut legislation that will enable community colleges to render services to the best of their ability, granted that aviation education has some inherent problems that differ from most other programs on campus.

As a result of the exposition of the problems related previously, and after reviewing the literature in the field, surveying previous reports, and interviewing those actively engaged in aviation education in the community colleges of the state, I would make these recommendations to the Aerospace-Aviation Task Force, and through the Task Force to the legislature and the Governor of the State of California.

1. Legislation should be passed combining all previous legislative enactments affecting aviation education in the community colleges, reducing this legislation to one single, comprehensive bill. This omnibus bill should contain those portions of previous legislative enactments that are desirable and constructive in assisting aviation education in the state. In addition, this bill should include several new provisions based upon the research and study undertaken by the Aerospace-Aviation Task Force. Some suggestions for new provisions are included in this report. I feel it would be equally desirable to pass an omnibus aviation bill for high schools; and since the community colleges and high schools are now under independent boards, this would require different enactments for each segment, but they could be very similar.
2. This omnibus aviation bill, hereafter referred to simply as the Aviation Bill, should include the previously expressed encouragement to community colleges to enter and serve the complex aerospace-aviation needs of the State of California. The working of this general encouragement could be similar to that incorporated in Sections 6001 and 25519 of the Education Code, and also incorporate some of the terminology used by Congressman Don H. Clausen in his proposal to Governor Ronald Reagan on December 15, 1968, in the mission of the Aerospace-Aviation Education Task Force. This encouragement to community college districts, and of course, high school districts, should be the preamble to the aviation bill. However, if the bill does not go beyond encouragement and does not attempt to solve some of the problems of aviation education, then let's forget the prose at this point and not waste our time.
3. Following the preamble, the aviation bill should tackle one by one the diverse problems of aviation education in the state. Some of these problems are identified here. There are probably others mentioned in other parts of the Task Force report.
4. The aviation bill should encourage the community colleges of the state to offer a variety of aviation-aerospace education programs, including flight training. The bill should authorize community colleges to own and operate their own aircraft for use in flight training or other aviation programs, and be able to lease aircraft for flight training programs. Also, the bill should specifically authorize the community colleges to be able to contract with fixed base operators for flight training, allowing the contract to include stipulations regarding the nature and supervision of such programs, as well as delineating fees, insurance provisions, granting of credit by the college, and other matters of mutual concern.
5. The aviation bill should specifically authorize the college to charge students for flight training as a laboratory fee. This fee should be based upon the actual costs of maintenance and operation of the aircraft. The fee might also include a provision for a prorated charge to cover the cost of purchase or lease of the aircraft, insurance premiums and deprecia-

tion. There should be no fees for ground school or other classroom or lecture-type aviation courses. It should not include any charge for staff time by a regularly contracted employee of the district, but might permit including these costs if the instructor were employed by the fixed base operator.

6. The bill should allow the college to collect these fees for flight training from the students and pay them to fixed base operators according to the provisions of a mutually agreeable contract, as provided for in point 4. This would enable the community colleges to retain a greater control over the safety provisions, standards, and curriculum offered by fixed base operators.
7. The bill should authorize a statewide cooperative or co-insurance plan so that all community colleges offering a flight training program, either with their own aircraft, leased aircraft, or through flying clubs or fixed base operators, could be covered under statewide acceptable and protective standards. If only the community colleges are under this statewide plan, it could be done under the auspices of the Board of Governors of the California Community Colleges. If the high schools and/or state colleges and universities, and private colleges are also to enjoy this collective co-insurance, then some arrangement would have to be made between the various boards, agreement reached on who would manage it, or it would have to be under the auspices of the Department of Aeronautics or some other detached agency. This cooperative plan should be initiated, developed, and implemented at a statewide level, in consultation with the community colleges, and should include liability protection for necessary coverage for all the participating community colleges. The state should have a general fund or "reserve" available for this purpose, and the community colleges could share in the costs by contributing a prorated share.
8. The cooperative insurance system should include statewide surveillance of standards of flight training programs to ensure that proper, reasonable, and satisfactory safety standards are observed by the community colleges. This should ensure that acceptable standards are met statewide, and end the current situation where some programs are noticeably more rigorous in meeting safety standards than others. Under the insurance system, a state inspector-pilot could be employed who would be responsible for checking the programs for these safety features, and insurance would be contingent upon meeting these standards. This would hold true for all types of college controlled or related flight training programs.
9. The aviation bill, or an accompanying appropriations bill, should authorize the commitment of state funds to give real meaning to the verbal encouragement and philosophical commitment of the state of aviation-aerospace education. These funds should include several chapters or provisions, including, but not necessarily limited to the following:
   a. Providing funds so that disadvantaged students might gain entry into flight training through grants, scholarships, and/or loans. This should include a subsidization of part or all of the cost of the flight training aspect of the program.
   b. Funds should be provided for capital outlay for initiating mechanic training programs, or flight training programs at community colleges, at least for a one-time outlay for the purchase of a plane or for the necessary basic equipment for beginning the mechanic training.
   c. Funds should be provided to staff an office for the insurance-safety surveillance aspect of the program. This office would include at least one inspector-pilot to verify that flight training programs were meeting statewide acceptable standards in order to qualify for co-insurance. Also, the office would include the personnel necessary to initiate, implement, and manage the co-insurance program for the community colleges. Funds should also be provided to form a state base or reserve for the co-insurance plan, with additional funds being derived from the premiums to be charged to the participating community colleges on a prorated basis. This office should also be prepared to lend assistance to community colleges in developing new programs, serve in a consultant capacity in developing curriculums, assist in establishing safety standards, writing sample contracts with fixed base operators and airports, encouraging articulation and regional planning, and keeping abreast of state and federal funding possibilities.
10. The Board of Governors of the California Community Colleges, the State Department of Education, the Board of Trustees of the California State Colleges, and the Board of

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Regents of the University, as well as the California Council for Higher Education and the State Legislature, should work cooperatively in developing aviation-aerospace education to assure that programs are planned with some continuity, and so that articulation is encouraged at all levels so that students may prepare careers sequentially, with few or no obstacles or hurdles imposed on their way as a result of poor articulation or cooperative planning. Regional and statewide meetings should occur frequently to allow those responsible for the development of these programs to see that this type of articulation is achieved.

The foregoing describes in broad-brush form the present status of aviation-aerospace education in California. Between the start of this study in 1969 and the present, severe economic setbacks have descended upon the aerospace-aviation industry nationwide; the setbacks have been particularly damaging to California because of the heavy dependence on aerospace industries in the State. The State finds itself in the unique and unpleasant position of having a predominant percentage of its unemployed consisting of professional, semi-professional, and highly skilled aerospace workers. Thus, the present status of the industry emphasizes the educational dilemma: What kinds of aerospace-aviation education programs should the State be concerned with, and how extensive should they be?

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Pertinent to this question are responses of aerospace-industry leaders who were polled in 1970 by the California State Department of Education "Study of Needs and Processes in California Aerospace Education." Following are selected composite responses taken from an analysis of content on the basis of their insight into the problem.

Question: What do you see as the need of current and future American society relative to aerospace education?

Answers:
1. There exists a great need for education for interdisciplinary competency, an integration of the disciplinary competency, an integration of the disciplines; vocational education and academic education to solve the same problems.
2. It is felt that future aerospace efforts will be subjected to greater scrutiny by socially-oriented priority-setters to integrate the humanities and technology for the betterment of society.
3. A better understanding of prevocational technology, industry, and manufacturing is needed by teachers and curriculum planners at the elementary and secondary levels.
4. The use of high-interest level artifacts (aerospace and aviation) can effectively communicate academic fundamentals at the elementary and secondary levels.

Question: Should education and industry participate in the definition of education and/or training programs?

Answer: There is a need for industry and education to participate in educational program development. (A strong inference was detected that the respondent view the products of the school system as salable/occupational skills.)

Question: Should special aerospace high schools be established?

Answer: A majority were not in favor of separate schools. It seems that the respondents viewed aerospace education either as a specific curriculum area, or as a vocational-oriented program designed to train employees for the aerospace industry.

The concept of an "all technology" theme, rather than just aerospace technology, was favored heavily.

Recommendations

Both general and specific recommendations are incorporated into this report.[46] They arise from these general sources:

(a) Direct recommendations of the members and subcommittees, including individuals in the Department of Education and the Department of Aeronautics;
(b) Patterns of expressed needs, in addition to direct recommendations;
(c) Comments from non-committee contributors;
(d) Repeated references in the printed source material attributed to nationally recognized aerospace-aviation educators.

I. Planned cooperation between education and industry to achieve:
   A. Flexibility of programming;
   B. Forecasts of manpower needs, the kinds and variety of skills;
   C. Work-Study programs, especially in technological fields.

   NOTE: Undue emphasis on particular skills of undemonstrated need should be avoided.

II. Creation of an effective position in the State Department of Education of professional

46. This refers to Dr. Walker's report to the Task Force.

aerospace-aviation education consultants, to assist in coordination and development of aerospace-aviation education programs at all levels. (An advisory commission, also proposed, is described in III, below.)

Some of the duties and responsibilities of the consultant are outlined here:

1. Coordinate with appropriate State agencies, especially the Department of Education and Department of Aeronautics;
2. Work under supervision of Chief State School Officer, since the nature of the work is educational, and access to the various educational institutions is vital to its success;
3. Conduct necessary research and gather data on which to plan the State aerospace-aviation education program at all levels;
4. Meet with the Advisory Commission regularly to coordinate all plans, both short- and long-range.
5. Keep records of programs as initiated; identify existing programs at elementary, secondary and college levels, as well as vocational, adult, or continuing education programs relating directly to aerospace-aviation education. (Exclude commercial schools.)
6. Coordinate planning of credit-bearing teacher orientation workshops or courses, pre- or in-service seminars and institutes; emphasis to be on integration of aerospace-aviation undertakings into the curriculum.
7. Set up a resource center, the location of which should be determined on the basis of a feasibility study.
8. Draw up a preliminary budget to reflect an orderly and equitable growth of programs at the various levels on a systems basis.
9. Coordinate and direct the development of curriculum guides, aids, and materials, as dictated by plans and needs.
10. Review and evaluate available texts and materials relating directly to aerospace-aviation education.
11. Maintain professional contacts with State and National organizations approved by the Advisory Commission.

III. Creation of an Advisory Commission, or Council, members of which reflect a variety of educational and industrial interests and groups. This Commission will be responsible for overall planning of the State program, and will direct the activities of the professional consultant through regular meetings.

IV. Adequate funding of the program development is recommended.

NOTE: It is not the concern of this report to find ways to fund the implementation of these recommendations.

V. Development of teacher-orientation courses or workshops of a general nature, to be offered pre- and in-service, for teachers at elementary and secondary levels, in all disciplines. Courses should be designed to create an appreciation for and awareness of changing technology, of which aerospace-aviation is a part, and its implications for all areas of the curriculum.

NOTE: This last recommendation is repeated under the Duties of the Consultant.

VI. Utilization of coordinated curricula of the "Learning Through Aviation" type, so successful at the Richmond Unified School District, on a wide scale in areas needing to motivate low achievers.

VII. Implementation of a broad pattern of aerospace-aviation curricula at secondary level; discouraging unwarranted emphasis on occupational-oriented curricula at the secondary level.

VIII. Encouragement of flexibility and innovation in aerospace-aviation curriculum planning, especially at the secondary level.

IX. Creation of more four-year college aerospace-aviation programs, with a broad selection of courses to meet a variety of professional and semi-professional categories.

X. Establishment of better articulation of two-year with four-year programs at the college level.

Appendix 8

Letter to Governor Reagan from John H. Shaffer, Administrator of the Federal Aviation Administration

Reprint of the Congressional Record, Extension of Remarks by the Honorable Don H. Clausen of California on the Merits of Aviation Education in our Schools, May 23, 1967.

Description of "Education Through Aviation," a program to help underachievers and minority youth get the best out of their present schooling by utilizing aviation as a motivator.

Reprint of the Congressional Record, Extension of Remarks by the Honorable Robert P. Griffin of Michigan in the Senate of the United States, October 10, 1972.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

10 OCT 1969

Honorable Ronald Reagan
Governor of California
Sacramento, California 95814

Dear Governor Reagan:

Our good friend, Congressman Don Clausen, has told me in detail of your and his efforts to further aviation and aerospace education in the State of California. He recently sent me a copy of your Proclamation establishing 1969 as Aerospace-Aviation Education Year throughout the state.

I wish to congratulate you, Congressman Clausen, and, especially, the members of your Aerospace-Aviation Education Task Force for the extraordinarily fine leadership role that California is playing in this vital area. Your effort is recognized as a first in the nation. We hope that other States will follow your leadership.

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I am convinced that many of the problems we face today in aviation development, planning and research stem from the fact that we have not had in the past sufficient educational experiences and opportunities for the typical citizen and aviation and aerospace participant.

Hopefully, with your type of encouraging educational and related leadership at local, state and national levels, our goals will be more easily met.

Sincerely,

J. H. Shaffer
Administrator

United States of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 90th CONGRESS, FIRST SESSION

Vol. 113 WASHINGTON, TUESDAY, MAY 23, 1967 No. 81

House of Representatives

The Merits of Aviation Education in Our Schools

Extension of Remarks of Hon. Don H. Clausen of California in the House of Representatives Tuesday, May 23, 1967

Mr. DON H. CLAUSEN. Mr. Speaker, recently I was asked to give the keynote address in New York City at the unveiling of a new general aviation trainer known as the GAT-1. In that address, I attempted to draw attention to the many benefits to be gained from exposing youth to aviation education at the earliest possible age and the importance of teaching the elements of aviation right along with scholastic subjects.

I have long been active in flight training programs for high schools in Northern California, Mr. Speaker, because I have long held that the airplane provides a partial but effective answer to many of the problems being experienced by and with our youth. Flight training, I submit, provides both motivation and a challenge for both boys and girls and it permits them to see for themselves, at an early age, what the future holds in store for them.

A case in point, which received nationwide recognition last summer, was when a 16-year-old high school student from my district flew solo in a family-rebuilt plane from California to Washington, D. C., and back via Florida and the Bahama Islands in a rare feat of airmanship. Recently this young man, Ron Cantrell, of Santa Rosa, California, was recognized as the "Outstanding Young Man of Flight" at the International Exposition of Flight in Las Vegas, Nevada.

Many of our youth today need motivation and a challenge. Many more seek identification and recognition in a complex society which they feel is passing them by. Problems of youth and juvenile delinquency are National problems for which our leaders and educators desperately seek answers. In my judgment, Mr. Speaker, aviation education is one answer. Not everyone, it is true, can learn to fly, but the great majority can be exposed to flight training.

We have all seen how the "age of flight" has enchanced our daily lives, our ability to shrink vast oceans and continents, and our capability to communicate more effectively with our fellow-men. Today, man reaches for the stars in space — flights thought virtually impossible a scant 25 years ago. But, in attempting to get to the moon, I would hope that we do not overlook the many untapped uses of conventional aircraft here on earth.

Mr. Speaker, I submit for inclusion in the RECORD the full text of my address on the merits of aviation education in our schools:

Address by Hon. Don H. Clausen, Representative in Congress, First District, California, at the Unveiling of the General Aviation Trainer — Gat-1 — April 24, 1967

On the recent cover of the Life Magazine issue of April 21, 1967, a provocative picture is portrayed. The words in bold print, "Modern Society's Growing Challenge — The Struggle To Be an Individual," appear.

I have the feeling that this article was timed to coincide with what we are attempting to do. Quite honestly, I believe that what we are presenting today could at least provide some of the answers to meet this challenge.

Our society has become too complex. We are locked in by the mobs and the trends toward collectivization. We are the victims of planners who have concentrated on the masses and left too little room for the individual. Young people are rebelling — seeking a way out of their entrapment. They are desperate in their quest for individual recognition and expression.

As the article states so well, "One of the unforeseen consequences of the welfare state is that it leaves so little room for personal idealisms; another is that it mutes the challenge to self-definition. All this is but another way of saying that it satisfies the

anxieties of the middle-aged while stifling the creative energies of the young."

Whether you want to admit it or not, one need only to look around us today and you will conclude that this is happening to our youth – partially because of our affluence, partially because of major technological advances in communications and transportation systems and equipment, and partially because of an over-emphasis on personal security and a lack of attention given to incentives or reward for initiative.

Certainly no Great Society will evolve unless you have a great people – great people are balanced people. This can only occur if we reinstate educational programs that permit the individual to put to use his God-given creative energies and at the same time demonstrate to himself and others that, given the chance, he can excel – he can exert and express himself in a most constructive manner.

Human energy is the mainspring to progress. Creative human energy, properly directed, will determine the future course the United States and its people will take. We will be a Nation of leaders or a Nation of followers. God only knows, the world is crying for qualified leaders to emerge in all corners of the Globe.

It is conceivable to me that the purpose for which we are assembled may well turn out to be a historic day.

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An exciting new era in general aviation is being launched today as we unveil the Link General Aviation Trainer, GAT-1. This represents a major breakthrough in providing aviation education tools and equipment for the private and public schools of America.

We are in the space age. Our young people are constantly seeking challenges with new horizons to conquer. What could be more appropriate than early exposure and a solid foundation in all phases of aviation?

Over 20 years ago, we placed a surplus World War II Link trainer in the classroom of Del Norte High School in California. I've seen the results first hand and have long advocated the placement of flight simulators in the schools of our country.

In October, 1965, I gave an address before the National Business Aircraft Association in which I said:

> "I am of the view that a broader exposure to aviation education at the earliest possible age would pay great dividends in later years.
>
> In addition to textbooks, I would like to see an inexpensive Flight Simulator developed for placement and use in the grade school classrooms of the country. A more sophisticated simulator could be made available to the high school and college level student. For those students that demonstrate an average-to-above aptitude, the next step would be flight training in aircraft or gliders."

Those were my comments in 1965. Shortly thereafter, Mr. Arthur Godfrey said on his CBS radio program "Dimension":

> "It's gratifying for those of us who fly to learn that some public high schools are now teaching the elements of aviation right along with scholastic subjects. The idea is catching on and there will come a day when youngsters learn to fly the way we hope they are being taught to drive a car. Let me bring you up-to-date on flight training in our schools:
>
> "What leaves the school drop-out with a spirit so dead, he wouldn't cut right out to the classroom if it contained a flight simulator? I mean a simulator, a working model of an aircraft cockpit with all the controls and instruments – only it never leaves the ground. Congressman Don Clausen of California is one who would like to see an inexpensive flight simulator developed for use in grade school classrooms, too. Not just high schools, grade schools – and not a toy either.

> "For the high school and college level students, of course, there would be more sophisticated simulators. And the good Congressman, Don H. Clausen, believes the above-average student should go on to actual flight training. Learn to handle an airplane just as he is taught now to drive a car. The Congressman, working with school officials in his hometown of Crescent City, California, saw such a program established and he has seen what can be done to motivate young men and women to improve their education when such training is available."

Today, as I am reading to you these words from Arthur Godfrey's Broadcast, I am seeing my dream come true, with the GAT-1 announcement. The education profession of America now has an exciting educational aid to place in their classrooms. It will

serve to motivate students to improve their education and alert them to a broader purpose in life.

The basic trainer, GAT-1, I am told, would lend itself to train the lower grade levels of education. I have long asked the question, "Why should our kids have to wait to go to the fairgrounds to enjoy the thrill of flying a "make believe" airplane? Particularly, when you consider it can be used as a tool to increase his or her interests in education if a basic or elementary flight simulator could be placed in the classroom. Imagine what this would do for the teacher, if she could "reward" her students for improving their education and at the same time coordinate her teaching material to show the student why it is necessary to learn the "Three R's" for our rapidly changing aviation and space age.

The basic trainer will have motion to demonstrate the effect of applying controls laterally, longitudinally, and horizontally. It will provide the sound of aircraft in flight. And, in the future, I have been advised, they are working on the addition of a visual system that might simulate adverse weather and/or terrain conditions. What a boon to safety that would be. Buffeting and Stalls can also be "cranked in."

Add to this the radio communication procedures for tower and cross country navigation under VFR and IFR conditions and one can certainly begin to realize the vast potential of this modern educational tool.

Advancement of the State of the Art has made all of this possible and it promises to broaden its influence on education as more uses are discovered.

Returning briefly to my earlier comments about providing educational programs that provide a maximum challenge to the individual:

The programmed learning techniques of GAT-1 are used to present the subject matter that is required in developing general aviation skills. This allows a student to progress at his own best rate. Training manuals and workbooks are offered for the instructor and the student. They are designed to meet the needs of high schools, colleges, and flight school operators.

The lessons are sequenced using small increments so that the trainee can achieve progress in his flight training in a satisfactory manner. The system provides feedback to the student so he can assess his own progress and his own level of retention. It has a built-in "motivator" in that it will continue to challenge him. He will never be able to achieve what might be called "perfect performance" because he will always find areas wherein he can improve his skills and increase the reliability of his performance.

The FAA, and in particular, Bob Reynolds, Ralph Lovering, George Stathers, Merv Strickler and Bob O'Neill, has been most helpful in seeing that this agency keeps abreast of new training equipment and techniques as they relate to general aviation.

It is encouraging to me as a Congressman to learn that the Federal Aviation Administration has recognized the value of pilot ground trainers. Just recently, through the issuance of the Notice of Proposed Rule Making, the FAA has prepared a comprehensive training package designed to up-grade and modernize pilot training and certification.

To me, the most significant feature of the proposal is the recognition of training given by certificated pilot instructors in a pilot ground trainer. Recent developments in the field of ground trainers indicate they may be used effectively for VFR as well as IFR flight training. It was through research sponsored by the FAA that the potential value of this type of training was proved.

The proposed recognition of training in ground devices – intentionally will not be limited as to kind and procedures so as not to discourage the development of different trainers and teaching methods as a pattern of effective instruction develops. The Administration would further modify the regulations to grant special recognition for the training discovered to be most valuable.

The unveiling of your GAT-1 today could have a significant bearing on the training for our pilots for the future. Certainly, anyone with an ounce of vision can see how a series of flight simulators, from an elementary basic trainer in grade schools, a more sophisticated general aviation trainer at the high school and college level, the jet simulator for advanced civil and military aviation, and then the ultimate in simulators for advanced supersonic and space craft, can project what tomorrow will provide in the way of challenges and opportunities for our youth.

The educational foundation must be built now, the young people of America must see, at an early age, what the future holds in store for them.

What better start could we offer them than that which is being unveiled today. This is "Operation Headstart" in the field of aviation education.

Just as we are appearing here today in New York, we all know too well the locked-in feeling of many of our young people, looking for something in the way of an exciting challenge to be presented to them.

Throughout our nation, we have young people turning to crime and violence because of their inability to see how they can participate with a broader purpose, in the economic and social aspects of life in our nation, our hemisphere, and potentially the world. They fail to see "the Big Picture" – all they see is their immediate surroundings.

Can you imagine what a flight simulator would do for the young people of the big cities who could never see an airplane close up, let alone, fly one. How

does the young man in New York or Chicago or Philadelphia or Los Angeles become motivated to see the big picture – how *he* could participate in the social and economic development of our emerging nations that are *craving* for *qualified* people who understand the workings of Democracy and the free *enterprise system*.

I believe early exposure to the GAT-1 might start him down the road to excellence because he sees the "way out" of his current dilemma – he sees that opportunities do exist everywhere in the world, providing he is qualified.

Once exposed, he can't help but become excited with the fact that *he* has an opportunity to advance himself – to become involved with the broad program of improving our way of life at home and abroad.

During the past two years, Jack Hunt of Embry-Riddle, Jack Crannell, myself and others have been working on a plan to offer specialized aviation education in emerging nations. It is planned that special private institutions will be established in selected countries, sponsored by private capital, following the guidelines of free enterprise. At the present time, we have four colleges with special programs in technical education developing pilot programs for our plan.

Research has indicated that the problem of training and educating the people of these countries will require a special technique. By and large, these people have not been exposed to a mechanical life comparable to that of American youth. Essentially, these young people are "camel drivers" who will require a concentrated course in "machine" operation. It is readily apparent that to try to accomplish this training in an airplane would be expensive and potentially dangerous. We have come to the conclusion, therefore, that to be effective in this program, it will be necessary to develop and utilize relatively inexpensive simulators and synthetic trainers with the capability of doing procedures training under close supervision .

Education today must provide the manpower training programs for these people. This requires new tools and visual aids to maximize the efforts of our teaching profession.

It is a proven fact that an extraordinarily high percentage of pilots who returned from World War II are among the leaders of our business, professional and political community. They learned the advantages of mobility that goes with the ability to fly. They were indoctrinated thoroughly about the need to maintain a high degree of flexibility. They were reminded constantly of the requirements for a superb individual performance. This was a program that demanded individual responsibility at its best.

Having been a Navy carrier pilot myself during World War II, I feel that my own career has been a living example of what I have referred to.

Having already enjoyed a full life, I am most anxious to have others share in the rewarding experience of "handling the controls" in one's personal exposure to the realm of flight. I believe GAT-1 will do this.

We have driver education programs – why not flying education? We have public and private Peace Corps – why not flying Peace Corps? I sincerely believe this Conference has placed us on the launching pad of a program that I hope will someday put "Wings on Americanism," with the hoped for objective of genuine peace on earth and good will toward all mankind, with liberty and justice for all.

Many years ago, Paul Revere rode his horse through the community to "wake the town and tell the people." Today I stand before you trying to express a similar thought. I believe the time has come for a number of Paul Reveres to wake our nation and tell its people – to wake the world and alert them to their unlimited possibilities "just over the horizon" – with the proper use of aircraft for constructive purposes, domestically and internationally.

Surely you would agree, however, that with our increasing world security problems, such as Vietnam, and contemplated other potential Vietnams in other sections of the world, we cannot resort to the use of a horse to transmit the American message to other countries. – We must become airborne.

I believe the time has come to organize and mobilize our constructive forces to put Communism on the defensive for a change, by demonstrating how the American miracle can work in other sections of the World.

All Americans can and must participate. In my judgment, this is the only way we can expect to retain security for our cherished way of life.

This is a bold program – I hope you will agree – it has imagination. It is a challenge. "I'd like to sink my teeth in." It is a challenge we can and must meet. Please join with me in saying "America First" for a change – the world and its people will welcome the restoration of the America they once knew, loved and respected.

Education Through Aviation

EDUCATION THROUGH AVIATION (ETA) has been formed by a group of dedicated aviation enthusiasts, to help underachievers and minority youth get the best out of their present schooling by utilizing aviation as a motivator. In Richmond, California, a similar program was introduced and the outcome stimulated the establishment of ETA in Los Angeles.

OUTCOME OF THE RICHMOND PROJECTS

Progress occurred in the following areas:

1. Attendance.
2. Holding power.
3. Reading and mathematical ability.
4. Tracking.
5. Behavior.

Attendance: During the first year of the project, flight group pupils had an absence rate averaging three days. The normal absence rate for their junior high school is 10.5 days per year. Teachers commented that the flight group boys came to school even when they were sick.

Holding Power: None of the project youths have dropped out of school. Several have moved into other programs where they are doing well.

Reading and Mathematical Ability: Reading ability increased remarkably for all flight group students. Earlier, an instructor commented: "The students now impress me with their ability to read rather complex, adult-level material which I have given them in the form of Civil Air Patrol books and magazine articles on aviation." Another instructor stated that the flight students are capable of absorbing vast amounts of information related to flying and that there is considerable carryover into other areas. In mathematics, 44 percent of the flight group received honor grades in senior high school, 31 percent received C grades, 25 percent received D grades, and there were no F grades.

Tracking: For the district as a whole, less than one-fifth of the black pupils are in the pre-college track. The fact of being in a specific track is likely to have a marked effect upon the pupils' level of aspiration and the efforts he exerts academically. Consignment to courses which are not recognized by the colleges is viewed as a sign of lesser worth by faculty, parents, and students alike. The aerospace project has done much to disprove the necessity of tracking high school students. Whereas the project pupils are enrolled in a non-tracked program which allows any of them the option of attending college, 76 percent of the control group pupils are enrolled in non-college tracks.

Behavioral Change: The instructors noted positive behavioral changes in most of the project youths. One commented: "Each one of the boys is more confident in himself. You can see this. They are freer in their conversations – more punctual getting to school in time for their airport trip. They can now sit down before I do, and sit for an hour at a time. This was absolutely impossible in the beginning." One of the pilot instructors claimed that all the boys in the flight group have gained increased self-confidence. They are able to master a machine, which at the beginning was completely foreign to them. It was a real challenge. It built up their self-confidence. They have command of the situation. Many of them got to the point where, if they were old enough, they could solo. Another important fact is that many of the non-achievers decided to continue their education after completion of high school.

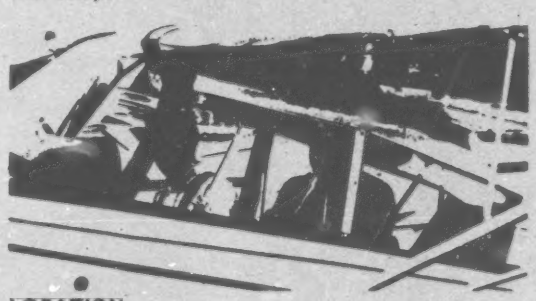
OBJECTIVES OF ETA

Simply stated, the goals of ETA are to help these students in the following ways:

1. Build up their self-confidence and self-esteem.
2. Stimulate and motivate them to help themselves.
3. Instill an urge to acquire vocational skills.
4. Stimulate them to improve their education.
5. Develop character that will make them into useful, productive citizens.

METHOD

The method by which ETA hopes to achieve its objectives is to expose these youngsters to the exciting field of aviation by having them participate in a ground school and flight indoctrination program for a period of five to six weeks. The program will consist of three to four hours one night a week, and one day on the weekend. The week night will include familiarization with all basic aspects of flight – aerodynamics, weather, flight rules, navigation, radio communication, etc. The weekend will consist of some classroom work and a field trip to various airports of interest, aerospace installations, air museums, and the like. Aerial transportation will be provided by members of ETA, all of whom hold commercial, instrument, and instructor ratings. At this point, it is important to point out that this program is only the first step of a proposed larger program which will be a three-month aviation summer camp.



LOCATION

ETA will conduct all classroom sessions at ACCELERATED GROUND TRAINING, 3200 Airport Boulevard, Santa Monica, California 90405. Telephone (213) 391-2244. Classes will begin the middle of October, 1972.

ELIGIBILITY

The program will be open to underachievers in the Los Angeles area. The first class will consist of fifteen students from 14 to 17 years of age.

FLIGHT INDOCTRINATION

Arrangements have been made which will give members of the group rides in airplanes, with, of course, the permission of the parents. All pilots volunteering to give these flight indoctrination flights are fully qualified and FAA certified flight and ground instructors.

COST

There will be no cost to the enrollees for the five-week course.

SUPPORT

The program has received the support and endorsement of the following:

FEDERAL AVIATION ADMINISTRATION

Mr. John L. Baker – Assistant Administrator for General Aviation.

Dr. Mervin K. Strickler, Jr. – Chief of Aviation Education.

CIVIL AIR PATROL

Mr. L. D. (Pat) Cody – Director of Aerospace Education

CALIFORNIA DEPARTMENT OF AERONAUTICS

Mr. Joseph R. Crotti – Director

FOUNDER

EDUCATION THROUGH AVIATION was founded by Mr. Lloyd Haynes of Television's "Room 222." A commercial and instrument rated pilot, Mr. Haynes was the inspiration and guiding force of this non-profit organization to expose the underprivileged student to a new environment by sharing with them his love of aviation and the optimism and enthusiasm which it engenders. Mr. Haynes is supported by a staunch group of aviation personnel who make up the ETA team. The other team members are:

Mr. Thomas W. Davis, FAA Controller and Instructor

Mr. Charles Dobson, FAA Pilot and Instructor

Mr. James Dorsey, TWA Pilot

Mr. Robert Ellis, Promotion and Management

Mr. Art Jones, National General Pilot and Instructor

Mr. Terrald Jones, TWA Pilot

Mr. Dave Long, TWA Pilot and Instructor

Mr. Stan McWilliams, TWA Pilot

Mr. Leigh Menelski, TWA Pilot and Instructor

Mr. Flavio Madariaga, FAA Certified Flight Examiner

Mr. Duke Morton, Pilot and Instructor

Mr. Robert Pastore, TWA Pilot and Instructor

Mr. John Weatherholdt, FAA Certified Examiner and Instructor

GPO 866-697